

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
 US Department of Commerce
 United States Patent and Trademark
 Office, PCT
 2011 South Clark Place Room
 CP2/5C24
 Arlington, VA 22202
 ETATS-UNIS D'AMERIQUE
 in its capacity as elected Office

Date of mailing (day/month/year) 12 January 2001 (12.01.01)	
International application No. PCT/US99/16968	Applicant's or agent's file reference P/3255-26
International filing date (day/month/year) 28 July 1999 (28.07.99)	Priority date (day/month/year) 28 July 1998 (28.07.98)
Applicant TAYLOR, Jack, Curtis et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
 18 February 2000 (18.02.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Sean Taylor Telephone No.: (41-22) 338.83.38
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PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference
(if desired) (12 characters maximum) P/3255-26

Box No. I TITLE OF INVENTION
ENHANCEMENT OF PROFILED TUBULAR LINING SYSTEMS BY CHANNEL AUGMENTATION

Box No. II APPLICANT

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

Safetyliner Systems, LLC
27286 Jimmy Lane
Conroe, TX 77385
United States of America

☐ This person is also inventor.

Telephone No.

Facsimile No.

Teleprinter No.

State (that is, country) of nationality:

US

State (that is, country) of residence:

US

This person is applicant for the purposes of:

☐ all designated States

☒ all designated States except the United States of America

☐ the United States of America only

☐ the States indicated in the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

Taylor, Jack Curtis
27221 Kane Lane
Conroe, TX 77385
United States of America

This person is:

☐ applicant only

☒ applicant and inventor

☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

US

State (that is, country) of residence:

US

This person is applicant for the purposes of:

☐ all designated States

☐ all designated States except the United States of America

☒ the United States of America only

☐ the States indicated in the Supplemental Box

☒ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE: OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:

☒ agent

☐ common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

Finder, James A.
Ostrolenk, Faber, Gerb & Soffen, LLP
1180 Avenue of the Americas
New York, New York 10036
United States of America

Telephone No

1 212 382-0700

Facsimile No

1 212 382-0888

Teleprinter No

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Continuation of Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

If none of the following sub-boxes is used, this sheet should not be included in the request.

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

Roach, Max Jerry
27286 Jimmy Lane
Conroe, TX 77385
United States of America

This person is:

- ☐ applicant only
- ☒ applicant and inventor
- ☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

US

State (that is, country) of residence:

US

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

- ☐ applicant only
- ☐ applicant and inventor
- ☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

- ☐ applicant only
- ☐ applicant and inventor
- ☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

- ☐ applicant only
- ☐ applicant and inventor
- ☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

☐ Further applicants and/or (further) inventors are indicated on another continuation sheet.

Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):

Regional Patent

- ☒ AP ARIPO Patent: GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SZ Swaziland, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☒ EA Eurasian Patent: AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ EP European Patent: AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☒ OA OAPI Patent: BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

National Patent (if other kind of protection or treatment desired, specify on dotted line):

- | | |
|--|--|
| <input checked="" type="checkbox"/> AL Albania | <input checked="" type="checkbox"/> LS Lesotho |
| <input checked="" type="checkbox"/> AM Armenia | <input checked="" type="checkbox"/> LT Lithuania |
| <input checked="" type="checkbox"/> AT Austria | <input checked="" type="checkbox"/> LU Luxembourg |
| <input checked="" type="checkbox"/> AU Australia | <input checked="" type="checkbox"/> LV Latvia |
| <input checked="" type="checkbox"/> AZ Azerbaijan | <input checked="" type="checkbox"/> MD Republic of Moldova |
| <input checked="" type="checkbox"/> BA Bosnia and Herzegovina | <input checked="" type="checkbox"/> MG Madagascar |
| <input checked="" type="checkbox"/> BB Barbados | <input checked="" type="checkbox"/> MK The former Yugoslav Republic of Macedonia |
| <input checked="" type="checkbox"/> BG Bulgaria | |
| <input checked="" type="checkbox"/> BR Brazil | <input checked="" type="checkbox"/> MN Mongolia |
| <input checked="" type="checkbox"/> BY Belarus | <input checked="" type="checkbox"/> MW Malawi |
| <input checked="" type="checkbox"/> CA Canada | <input checked="" type="checkbox"/> MX Mexico |
| <input checked="" type="checkbox"/> CH and LI Switzerland and Liechtenstein | <input checked="" type="checkbox"/> NO Norway |
| <input checked="" type="checkbox"/> CN China | <input checked="" type="checkbox"/> NZ New Zealand |
| <input checked="" type="checkbox"/> CU Cuba | <input checked="" type="checkbox"/> PL Poland |
| <input checked="" type="checkbox"/> CZ Czech Republic | <input checked="" type="checkbox"/> PT Portugal |
| <input checked="" type="checkbox"/> DE Germany | <input checked="" type="checkbox"/> RO Romania |
| <input checked="" type="checkbox"/> DK Denmark | <input checked="" type="checkbox"/> RU Russian Federation |
| <input checked="" type="checkbox"/> EE Estonia | <input checked="" type="checkbox"/> SD Sudan |
| <input checked="" type="checkbox"/> ES Spain | <input checked="" type="checkbox"/> SE Sweden |
| <input checked="" type="checkbox"/> FI Finland | <input checked="" type="checkbox"/> SG Singapore |
| <input checked="" type="checkbox"/> GB United Kingdom | <input checked="" type="checkbox"/> SI Slovenia |
| <input checked="" type="checkbox"/> GE Georgia | <input checked="" type="checkbox"/> SK Slovakia |
| <input checked="" type="checkbox"/> GH Ghana | <input checked="" type="checkbox"/> SL Sierra Leone |
| <input checked="" type="checkbox"/> GM Gambia | <input checked="" type="checkbox"/> TJ Tajikistan |
| <input checked="" type="checkbox"/> GW Guinea-Bissau | <input checked="" type="checkbox"/> TM Turkmenistan |
| <input checked="" type="checkbox"/> HR Croatia | <input checked="" type="checkbox"/> TR Turkey |
| <input checked="" type="checkbox"/> HU Hungary | <input checked="" type="checkbox"/> TT Trinidad and Tobago |
| <input checked="" type="checkbox"/> ID Indonesia | <input checked="" type="checkbox"/> UA Ukraine |
| <input checked="" type="checkbox"/> IL Israel | <input checked="" type="checkbox"/> UG Uganda |
| <input checked="" type="checkbox"/> IS Iceland | <input checked="" type="checkbox"/> US United States of America |
| <input checked="" type="checkbox"/> JP Japan | |
| <input checked="" type="checkbox"/> KE Kenya | <input checked="" type="checkbox"/> UZ Uzbekistan |
| <input checked="" type="checkbox"/> KG Kyrgyzstan | <input checked="" type="checkbox"/> VN Viet Nam |
| <input checked="" type="checkbox"/> KP Democratic People's Republic of Korea | <input checked="" type="checkbox"/> YU Yugoslavia |
| | <input checked="" type="checkbox"/> ZW Zimbabwe |
| <input checked="" type="checkbox"/> KR Republic of Korea | |
| <input checked="" type="checkbox"/> KZ Kazakhstan | |
| <input checked="" type="checkbox"/> LC Saint Lucia | |
| <input checked="" type="checkbox"/> LK Sri Lanka | |
| <input checked="" type="checkbox"/> LR Liberia | |

Check-boxes reserved for designating States (for the purposes of a national patent) which have become party to the PCT after issuance of this sheet:

- ☒ India IN
- ☒ South Africa ZA

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation of a designation consists of the filing of a notice specifying that designation and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.)

Supplemental Box

If the Supplemental Box is not used, this sheet should not be included in the request.

1. If in any of the Boxes, the space is insufficient to furnish all the information: in such case, write "Continuation of Box No. ..." (indicate the number of the Box) and furnish the information in the same manner as required according to the captions of the Box in which the space was insufficient, in particular:

- (i) if more than two persons are involved as applicants and/or inventors and no "continuation sheet" is available: in such case, write "Continuation of Box No. III" and indicate for each additional person the same type of information as required in Box No. III. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below;
- (ii) if in Box No. II or in any of the sub-boxes of Box No. III, the indication "the States indicated in the Supplemental Box" is checked: in such case, write "Continuation of Box No. II" or "Continuation of Box No. III" or "Continuation of Boxes No. II and No. III" (as the case may be); indicate the name of the applicant(s) involved and, next to each such name, the State(s) (and/or, where applicable, ARIPO, Eurasian, European or OAPI patent), for the purposes of which the named person is applicant;
- (iii) if in Box No. II or in any of the sub-boxes of Box No. III, the inventor or the inventor/applicant is not inventor for the purposes of all designated States or for the purposes of the United States of America: in such case, write "Continuation of Box No. II" or "Continuation of Box No. III" or "Continuation of Boxes No. II and No. III" (as the case may be); indicate the name of the inventor(s) and, next to each such name, the State(s) (and/or, where applicable, ARIPO, Eurasian, European or OAPI patent) for the purposes of which the named person is inventor;
- (iv) if in addition to the agent(s) indicated in Box No. IV, there are further agents: in such case, write "Continuation of Box No. IV" and indicate for each further agent the same type of information as required in Box No. IV;
- (v) if in Box No. V, the name of any State (or OAPI) is accompanied by the indication "patent of addition," or "certificate of addition," or if in Box No. V, the name of the United States of America is accompanied by an indication "continuation" or "continuation-in-part": in such case, write "Continuation of Box No. V" and the name of each State involved (or OAPI), and after the name of each such State (or OAPI), the number of the parent title or parent application and the date of grant of the parent title or filing of the parent application;
- (vi) if in Box No. VI, there are more than three earlier applications whose priority is claimed: in such case, write "Continuation of Box No. VI" and indicate for each additional earlier application the same type of information as required in Box No. VI;
- (vii) if in Box No. VI, the earlier application is an ARIPO application: in such case, write "Continuation of Box No. VI", specify the number of the item corresponding to that earlier application and indicate at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed.

2. If, with regard to the precautionary designation statement contained in Box No. I, the applicant wishes to exclude any State(s) from the scope of that statement: in such case, write "Designation(s) excluded from precautionary designation statement" and indicate the name or two-letter code of each State so excluded.

3. If the applicant claims, in respect of any designated Office, the benefits of provisions of the national law concerning non-prejudicial disclosures or exceptions to lack of novelty: in such case, write "Statement concerning non-prejudicial disclosures or exceptions to lack of novelty" and furnish that statement below.

CONTINUATION OF BOX NO. IV

Weiner, Samuel H.
 Berliner, Jerome M.
 Faber, Robert C.

Lieberstein, Stanley H.
 Weisburd, Steven I.
 Moskowitz, Max
 Meilman, Edward A.
 Gray, William O. III
 Dujmich, Louis C.
 Miro, Douglas A.
 Soffen, Stephen A.
 Einhorn, Harold

BEST AVAILABLE COPY

Box No. VI PRIORITY CLAIM

☐ Further priority claims are indicated in the Supplemental Box.

Filing date of earlier application <i>day/month/year</i>	Number of earlier application	Where earlier application is:		
		national application: country	regional application: regional Office	international application: receiving Office
Item (1) 28 July 1998 (28.07.98)	60/094,326	US		US
Item (2)				
Item (3)				

☒ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s): (1)

* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) (if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used): ISA / US

Request to use results of earlier search: reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority):

Date (day/month/year) Number Country (or regional Office)

Box No. VIII CHECK LIST: LANGUAGE OF FILING

This international application contains the following number of sheets:

request : 05

description (excluding
sequence listing part) : 13

claims : 05

abstract : 01

drawings : 08

sequence listing part
of description :

Total number of sheets : 32

This international application is accompanied by the item(s) marked below:

- ☒ fee calculation sheet
- ☐ separate signed power of attorney
- ☐ copy of general power of attorney; reference number, if any:
- ☐ statement explaining lack of signature
- ☐ priority document(s) identified in Box No. VI as item(s):
- ☐ translation of international application into (language):
- ☐ separate indications concerning deposited microorganism or other biological material
- ☐ nucleotide and/or amino acid sequence listing in computer readable form
- ☒ other (specify): check # 8575 in the amount of \$2480.00

Figure of the drawings which should accompany the abstract: 4a

Language of filing of the international application: English

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

By

James A. Finder

July 28, 1999

For receiving Office use only	
1. Date of actual receipt of the purported international application:	2. Drawings: <input type="checkbox"/> received: <input type="checkbox"/> not received:
3. Corrected date of actual receipt due to later but timely received papers or drawings comprising the purported international application:	
4. Date of timely receipt of the required corrections under PCT Article 11(2):	
5. International Searching Authority (if two or more are competent): ISA	6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid.

Date of receipt of the record copy by the International Bureau: For International Bureau use only

W 09/744 613
5050

PATENT COOPERATION TREATY

PCT

REC'D 12 DEC 2000

WIPO

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

15

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference IR103780	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US99/16986	International filing date (day/month/year) 29 JULY 1999	Priority date (day/month/year) 31 JULY 1998
International Patent Classification (IPC) or national classification and IPC IPC(7): H04Q 7/38 and US Cl.: 455/436, 428		
Applicant MOTOROLA, INC.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets.

☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority. (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 0 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of report with regard to novelty, inventive step or industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 07 FEBRUARY 2000	Date of completion of this report 09 NOVEMBER 2000
Name and mailing address of the IPEA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231	Authorized officer LEE NGUYEN <i>Ruegenia Zagan</i>
Facsimile No. (703) 305-3230	Telephone No. (703) 308-5240

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US99/16986

I. Basis of the report

1. This report has been drawn on the basis of *(Substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments).*

☒ the international application as originally filed.

☒ the description, pages 1-12 , as originally filed.

pages NONE , filed with the demand.

pages NONE , filed with the letter of _____.

pages _____ , filed with the letter of _____.

☒ the claims, Nos. 13-15 , as originally filed.

Nos. NONE , as amended under Article 19.

Nos. NONE , filed with the demand.

Nos. NONE , filed with the letter of _____.

Nos. _____ , filed with the letter of _____.

☒ the drawings, sheets/fig 1-4 , as originally filed.

sheets/fig NONE , filed with the demand.

sheets/fig NONE , filed with the letter of _____.

sheets/fig _____ , filed with the letter of _____.

2. The amendments have resulted in the cancellation of:

☒ the description, pages NONE .

☒ the claims, Nos. NONE .

☒ the drawings, sheets/fig NONE .

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the ~~Supplemental Box~~ Additional observations below (Rule 70.2(c)).

4. Additional observations, if necessary:

NONE

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US99/16986

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. STATEMENT**

Novelty (N)	Claims <u>2-3, 8-10</u>	YES
	Claims <u>1, 4-7</u>	NO
Inventive Step (IS)	Claims <u>NONE</u>	YES
	Claims <u>1-10</u>	NO
Industrial Applicability (IA)	Claims <u>1-10</u>	YES
	Claims <u>NONE</u>	NO

2. CITATIONS AND EXPLANATIONS

Claims 1, 4-7 lack novelty under PCT Article 33(2) as being anticipated by Bertiger et al. (US 5,161,248).

Regarding claims 1, and 6-7, Bertiger teaches a handoff in a satellite communication, comprising the steps of: dividing the earth into a plurality of regions 20-32 (fig. 1) with the cellular size and inherently a plurality of communication units 22 (only one shown) can be handed-off as a group (col. 3, lines 30-36). Bertiger also teaches the antenna beams as claimed (col. 3, lines 6-10); Bertiger also teaches the correlation, determination and handing-off one or more communication units simultaneously (col. 3, lines 30-36).

Regarding claim 4, Bertiger also teaches the boundary of cell 24 (col. 3, lines 42-49).

Regarding claim 5, Bertiger inherently teaches the step of sending a single message to direct the CU to handoff as claimed (col. 5, lines 5-19).

Claims 2-3 lack an inventive step under PCT Article 33(3) as being obvious over Bertiger et al. (US 5,161,248).

Regarding claim 2, Bertiger fails to teach intersatellite handoff and handoff of different frequencies. The art of providing intersatellite handoff and different frequencies is conventionally well known. It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide intersatellite handoff in order to ensure continued communication and to provide different frequencies in order to prevent co-channel interference.

Regarding claim 3, the claim lacks an inventive step for the same reason as set forth in claim 2.

Claims 8-10 lack an inventive step under PCT Article 33(3) as being obvious over Chandos et al. (US 5,561,838) in view of Schipper (US 5,669,061).

Regarding claim 8, Chandos teaches a satellite communication system with one nongeostationary satellite 12 (fig. 1); at least one network control facility 16 and a communication unit CU 24, comprising: a transceiver 92-93. Chandos also teaches a memory 97 (Continued on Supplemental Sheet.)

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Boxes I - VIII

Sheet 10

V. 2. REASONED STATEMENTS - CITATIONS AND EXPLANATIONS (Continued):

and a controller 96 (fig. 5) for performing handoff according to instruction from the satellite 12 and the network controller facility 16 (abstract). Chandos fails to teach that the handoff is based on a received region based map stored in the memory. However, this technique is conventionally well known, as taught by Schipper. Schipper teaches that a communication unit 11 includes a region based map stored in memory 33 for determining a handoff (col. 7, line 47 through col. 8, line 18 and col. 9, lines 29-44). With this technical knowledge, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the teaching of Schipper to the system of Chandos in order to provide a system that may be local or global for automatically tracking the movements of a plurality of cellphone subscribers.

Regarding claims 9-10, Chandos as modified inherently teaches the handoff instructions and receiving a message in a particular cell zone in fig. 2.

----- NEW CITATIONS -----

US 5,161,248 A (BERTIGER et al) 03 NOVEMBER 1992, see figure 1, col. 3, lines 30-36.

US 5,561,838 A (CHANDOS et al) 01 OCTOBER 1996, see figure 1, abstract.

US 5,669,061 A (SCHIPPER) 16 SEPTEMBER 1997, see col. 7, line 47 through col. 8, line 18.

PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

NOTIFICATION OF RECEIPT OF
RECORD COPY

(PCT Rule 24.2(a))

To:

FINDER, James, A.
Ostrolenk, Faber, Gerb & Soffen,
LLP
1180 Avenue of the Americas
New York, NY 10036
ÉTATS-UNIS D'AMÉRIQUE

Date of mailing (day/month/year)
17 September 1999 (17.09.99)

IMPORTANT NOTIFICATION

Applicant's or agent's file reference
P/3255-26

International application No.
PCT/US99/16968

The applicant is hereby notified that the International Bureau has received the record copy of the international application as detailed below.

Name(s) of the applicant(s) and State(s) for which they are applicants:

SAFETYLINER SYSTEMS, LLC (for all designated States except US)
TAYLOR, Jack, Curtis et al (for US)

International filing date : 28 July 1999 (28.07.99)
Priority date(s) claimed : 28 July 1998 (28.07.98)
Date of receipt of the record copy
by the International Bureau : 31 August 1999 (31.08.99)
List of designated Offices :

AP : GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW

EA : AM, AZ, BY, KG, KZ, MD, RU, TJ, TM

EP : AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE

OA : BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG

National : AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM,
HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ,
PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW

OFCS FILE No.	P/3501-3
PATENTS ORDERED	

ATTENTION

The applicant should carefully check the data appearing in this Notification. In case of any discrepancy between these data and the indications in the international application, the applicant should immediately inform the International Bureau.

In addition, the applicant's attention is drawn to the information contained in the Annex, relating to:

- ☒ time limits for entry into the national phase
☒ confirmation of precautionary designations
☒ requirements regarding priority documents

A copy of this Notification is being sent to the receiving Office and to the International Searching Authority.

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Authorized officer:

Eugénia Santos

Facsimile No. (41-22) 740.14.35

Telephone No. (41-22) 338.83.88

INFORMATION ON TIME LIMITS FOR ENTERING THE NATIONAL PHASE

The applicant is reminded that the "national phase" must be entered before each of the designated Offices indicated in the Notification of Receipt of Record Copy (Form PCT/IB/301) by paying national fees and furnishing translations, as prescribed by the applicable national laws.

The time limit for performing these procedural acts is **20 MONTHS** from the priority date or, for those designated States which the applicant elects in a demand for international preliminary examination or in a later election, **30 MONTHS** from the priority date, provided that the election is made before the expiration of 19 months from the priority date. Some designated (or elected) Offices have fixed time limits which expire even later than 20 or 30 months from the priority date. In other Offices an extension of time or grace period, in some cases upon payment of an additional fee, is available.

In addition to these procedural acts, the applicant may also have to comply with other special requirements applicable in certain Offices. It is the applicant's responsibility to ensure that the necessary steps to enter the national phase are taken in a timely fashion. Most designated Offices do not issue reminders to applicants in connection with the entry into the national phase.

For detailed information about the procedural acts to be performed to enter the national phase before each designated Office, the applicable time limits and possible extensions of time or grace periods, and any other requirements, see the relevant Chapters of Volume II of the PCT Applicant's Guide. Information about the requirements for filing a demand for international preliminary examination is set out in Chapter IX of Volume I of the PCT Applicant's Guide.

GR and ES became bound by PCT Chapter II on 7 September 1996 and 6 September 1997, respectively, and may, therefore, be elected in a demand or a later election filed on or after 7 September 1996 and 6 September 1997, respectively, regardless of the filing date of the international application. (See second paragraph above.)

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

CONFIRMATION OF PRECAUTIONARY DESIGNATIONS

This notification lists only specific designations made under Rule 4.9(a) in the request. It is important to check that these designations are correct. Errors in designations can be corrected where precautionary designations have been made under Rule 4.9(b). The applicant is hereby reminded that any precautionary designations may be confirmed according to Rule 4.9(c) before the expiration of 15 months from the priority date. If it is not confirmed, it will automatically be regarded as withdrawn by the applicant. There will be no reminder and no invitation. Confirmation of a designation consists of the filing of a notice specifying the designated State concerned (with an indication of the kind of protection or treatment desired) and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.

REQUIREMENTS REGARDING PRIORITY DOCUMENTS

For applicants who have not yet complied with the requirements regarding priority documents, the following is recalled.

Where the priority of an earlier national, regional or international application is claimed, the applicant must submit a copy of the said earlier application, certified by the authority with which it was filed ("the priority document") to the receiving Office (which will transmit it to the International Bureau) or directly to the International Bureau, before the expiration of 16 months from the priority date, provided that any such priority document may still be submitted to the International Bureau before that date of international publication of the international application, in which case that document will be considered to have been received by the International Bureau on the last day of the 16-month time limit (Rule 17.1(a)).

Where the priority document is issued by the receiving Office, the applicant may, instead of submitting the priority document, request the receiving Office to prepare and transmit the priority document to the International Bureau. Such request must be made before the expiration of the 16-month time limit and may be subjected by the receiving Office to the payment of a fee (Rule 17.1(b)).

If the priority document concerned is not submitted to the International Bureau or if the request to the receiving Office to prepare and transmit the priority document has not been made (and the corresponding fee, if any, paid) within the applicable time limit indicated under the preceding paragraphs, any designated State may disregard the priority claim, provided that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity to furnish the priority document within a time limit which is reasonable under the circumstances.

Where several priorities are claimed, the priority date to be considered for the purposes of computing the 16-month time limit is the filing date of the earliest application whose priority is claimed.

PATENT COOPERATION TREATY

From the RECEIVING OFFICE

PCT

To:

JAMES A. FINDER
OSTROLENK, FABER, GERB & SOFFEN, LLP
1180 AVENUE OF THE AMERICAS
NEW YORK NY 10036

NOTIFICATION OF THE INTERNATIONAL APPLICATION NUMBER AND OF THE INTERNATIONAL FILING DATE

(PCT Rule 20.5(c))

Applicant's or agent's file reference P/3255-26		IMPORTANT NOTIFICATION	
International application No. PCT/US99/16968	International filing date (day/month/year) 28 JUL 99	Priority date (day/month/year) 28 JUL 98	
Applicant SAFETYLINER SYSTEMS, LLC			
Title of the invention ENHANCEMENT OF PROFILED TUBULAR LINING SYSTEMS BY CHANNEL AUGMENTATION			

1. The applicant is hereby notified that the international application has been accorded the international application number and the international filing date indicated above.

 2. The applicant is further notified that the record copy of the international application:

☒

was transmitted to the International Bureau on **26 AUG 1999**

☐ has not yet been transmitted to the International Bureau for the reason indicated below and a copy of this notification has been sent to the International Bureau*:

☐ because the necessary national security clearance has not yet been obtained.
☐ because (reason to be specified):
- * The International Bureau monitors the transmittal of the record copy by the receiving Office and will notify the applicant (with Form PCT/IB/301) of its receipt. Should the record copy not have been received by the expiration of 14 months from the priority date, the International Bureau will notify the applicant (Rule 22.1(c)).

3. FOREIGN TRANSMITTAL LICENSE INFORMATION

Completed by: DMH

- ☐ Additional license for foreign transmittal not required. This subject matter is covered by a license already granted on the equivalent U.S. national application. Refer to that license for information concerning its scope.
☐ License for foreign transmittal not required. 37 CFR 5.11(e)(1) or 37 CFR 5.11(e)(2). However, a license may be required for additional subject matter. See 37 CFR 5.15(b).
☒ Foreign transmittal license granted. 35 U.S.C. 184; 37 CFR 5.11 on 8-10-99 :

☒ 37 CFR 5.15(a)

☐ 37 CFR 5.15(b)

Name and mailing address of the receiving Office Assistant Commissioner for Patents Box PCT Washington, D.C. 20231 Facsimile No.	Authorized officer Jerry McDowell PCT/International Appl Processing Div. (703) 305-3639 Telephone No.
--	---

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

To:

JAMES A. FINDER
OSTROLENK, FABER, GERB & SOFFEN, LLP
1180 AVENUE OF THE AMERICAS
NEW YORK NY 10036

NOTIFICATION OF RECEIPT OF SEARCH COPY

(PCT Rule 25.1)

Date of mailing
(day/month/year)

2 6 AUG '99

Applicant's or agent's file reference

P/3255-26

IMPORTANT NOTIFICATION

International application No.

PCT/US99/16968

International filing date (day/month/year)

28 JUL 99

Priority date (day/month/year)

28 JUL 98

Applicant

SAFETYLINER SYSTEMS, LLC

1. Where the International Searching Authority and the receiving Office are not the same Office:
The applicant is hereby notified that the search copy of the international application was received by this International Searching Authority on the date indicated below.

Where the International Searching Authority and the receiving Office are the same Office:
The applicant is hereby notified that the search copy of the international application was received on the date indicated below.

2 6 AUG 1999

(date of receipt)

2. Time limit for establishment of international search report
The applicant is informed that the time limit for establishing the international search report is 3 months from the date of receipt indicated above or 9 months from the priority date, whichever time limit expires later.
3. A copy of this notification has been sent to the International Bureau and, where the first sentence of paragraph 1 applies, to the receiving Office.

Name and mailing address of the ISA/US
Assistant Commissioner for Patents
Box PCT
Washington, D.C. 20231
Facsimile No.

Attn: ISA/US

Authorized officer

Jeryl McDowell
PCT/Internat'l Appl Processing Div.
(703) 305-3639

Telephone No.

PATENT COOPERATION TREATY

PCT

REC'D 08 DEC 2000

WIPO

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT


(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P/3501-3	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US99/16968	International filing date (day/month/year) 28 JULY 1999	Priority date (day/month/year) 28 JULY 1998
International Patent Classification (IPC) or national classification and IPC IPC(7): F16L 11/00, 9/00, 55/16, 9/18 and US Cl.: 138/97, 114, 140, 174, 111		
Applicant SAFETYLINER SYSTEMS, LLC		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets.
- ☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority. (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).
- These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of report with regard to novelty, inventive step or industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 18 FEBRUARY 2000	Date of completion of this report 08 NOVEMBER 2000
Name and mailing address of the IPEA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer  ANDRES KASHNIKOV Telephone No. (703) 308-0861

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US99/16968

I. Basis of the report

1. With regard to the elements of the international application:*

☐ the international application as originally filed☒ the description:

pages _____ (See Attached)

, as originally filed

pages _____, filed with the demand

pages _____, filed with the letter of _____

☒ the claims:

pages _____ (See Attached)

, as originally filed

pages _____, as amended (together with any statement) under Article 19

pages _____, filed with the demand

pages _____, filed with the letter of _____

☒ the drawings:

pages _____ (See Attached)

, as originally filed

pages _____, filed with the demand

pages _____, filed with the letter of _____

☒ the sequence listing part of the description:

pages _____ (See Attached)

, as originally filed

pages _____, filed with the demand

pages _____, filed with the letter of _____

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language _____ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).☐ the language of publication of the international application (under Rule 48.3(b)).☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in printed form.☐ filed together with the international application in computer readable form.☐ furnished subsequently to this Authority in written form.☐ furnished subsequently to this Authority in computer readable form.☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.4. ☒ The amendments have resulted in the cancellation of:☒ the description, pages _____ NONE☒ the claims, Nos. _____ NONE☒ the drawings, sheets/fig _____ NONE5. ☐ This report has been drawn as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

**Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US99/16968

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. statement**

Novelty (N)	Claims	<u>(Please See supplemental sheet)</u>	YES
	Claims	<u>(Please See supplemental sheet)</u>	NO
Inventive Step (IS)	Claims	<u>(Please See supplemental sheet)</u>	YES
	Claims	<u>(Please See supplemental sheet)</u>	NO
Industrial Applicability (IA)	Claims	<u>(Please See supplemental sheet)</u>	YES
	Claims	<u>(Please See supplemental sheet)</u>	NO

2. citations and explanations (Rule 70.7)

Claims 1-3 and 35-40 lack an inventive step under PCT Article 33(3) as being obvious over Wilson in view of Horner et al.

The patent to Wilson discloses a tubular system comprising a tubular 17 and a liner 18 having a plurality of channels 19 in the tubular in which the outer wall of the liner engages the inner wall of the tubular (see Figure 4) and the liner 18 having a hollow bore 16. Wilson does not disclose at least one elongated member disposed between the liner and the tubular and the method of assembling as recited. The patent to Horner et al. teaches a hose having a plurality of elongated conduit members 41 disposed between a liner 42 and a tubular 44 in which the hose is assembled by sliding the tubular 44 over the liner 42 and members 41. Because of the sliding contact between the members 41 and liner 42, the members will be protected against deformation when pulled. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the device of Wilson by incorporating at least elongated member between the tubular and the liner and to have assembled the device by pulling the tubular over the liner and elongated members and providing a sliding contact between the tubular and liner in order to prevent deformation of the tubular as taught by Horner et al. in order to assemble a tubular system. Horner et al. does not disclose pulling the liner and member into the tubular. It would have been a matter of design choice to pull the liner and member into the tubular as opposed to pulling the tubular over the liner and member as taught by Horner et al., since there is no significant improvement in pulling the liner and member into the tubular over pulling the tubular over the liner and member as they will both carry out the same function. The elongated member comprising a communications cable, a heating cable, a force-sensing cable, or an electrical or fluid carrying conduit is strictly intended use.

Claims 21-24 lack novelty under PCT Article 33(2) as being anticipated by Foucras.

(Continued on Supplemental Sheet.)

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Sheet 10

Continuation of: Boxes I - VIII

I. BASIS OF REPORT:

This report has been drawn on the basis of the description,
page(s) 1-13, as originally filed.
page(s) NONE, filed with the demand.
and additional amendments:
NONE

This report has been drawn on the basis of the claims,
page(s) 14-18, as originally filed.
page(s) NONE, as amended under Article 19.
page(s) NONE, filed with the demand.
and additional amendments:
Pages 19-21, filed with letter of 11 September 2000.

This report has been drawn on the basis of the drawings,
page(s) 1-14, as originally filed.
page(s) NONE, filed with the demand.
and additional amendments:
NONE

This report has been drawn on the basis of the sequence listing part of the description:
page(s) NONE, as originally filed.
pages(s) NONE, filed with the demand.
and additional amendments:
NONE

V. 1. REASONED STATEMENTS:

The report as to Novelty was positive (YES) with respect to claims 1-20 and 25-45.
The report as to Novelty was negative (NO) with respect to claims 21-24.
The report as to Inventive Step was positive (YES) with respect to claims 4-20, 25, 26, 30, 34, and 41-45.
The report as to Inventive Step was negative (NO) with respect to claims 1-3, 21-24, 27-29, 31-33, and 35-40.
The report as to Industrial Applicability was positive (YES) with respect to claims 1-45.
The report as to Industrial Applicability was negative (NO) with respect to claims NONE.

V. 2. REASONED STATEMENTS - CITATIONS AND EXPLANATIONS (Continued):

The patent to Foucras shows a tubular system having a host tubular 3, a liner 1 in the tubular 3 in which the outer wall of the liner 1 engages the inner wall of the tubular 3, a hollow bore in the liner 1, and polymer covered electrically conductive elongated wires 2 (Column 2, Lines 61-63) disposed between the tubular 3 and the liner 1 (Figure 2) to provide heating for keeping the temperature of a fluid constant. As shown in Figure 2, the heating elements 2 penetrate the surface of the liner 1, thus indicating channels formed on the surface of liner 1 in which the heating elements 2 are inserted.

Claims 27-29 and 31-33 lack an inventive step under PCT Article 33(3) as being obvious over Foucras in view of Louwagie et al.

The patent to Foucras discloses the claimed invention except for the pressure sensing member to indicate location of a blockage. The patent to Louwagie et al. teaches using a pressure sensor 50 which senses the differential pressure across a pipe 4 (Column 4, Lines 60-63) through a strain gauge pressure sensor 52. A sudden rise in pressure at a particular location along the pipe can indicate a blockage at that location. The circuitry can be one or more optical fibers (Column 13, Lines 14-16). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the device of Foucras by incorporating strain gauge pressure sensors and optical fibers in the circuitry in order to measure pressure differentials across the pipe as taught by Louwagie et al. in to detect blockages along the pipe and their locations.

Claims 4-20, 25, 26, 30, 34, and 41-45 meet the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest the step of placing a predetermined initial stress on the liner to induce a strain and pulling the member so that

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US99/16968

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Boxes I - VIII

Sheet 11

the liner is pulled along with the member without inducing substantial additional strain on the liner and the adhering step of disposing the elongated member in the channel and then compressing the channel so that channel grips elongated member.

----- NEW CITATIONS -----

US 4,038,519 A (FOUCRAS) 26 JULY 1977, see column 1, lines 66-68 and column 2, lines 43-64.

US 5,606,513 A (LOUWAGIE et al.) 25 FEBRUARY 1997, see column 4, lines 59-67.

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AMENDED CLAIMS

[received by the International Bureau on 12 June 2000 (12.06.00);
original claim 11 amended; new claims 36-45 added;

through said member.

remaining claims unchanged (3 pages)]

IPEA/US 11 SEP 2000

9. The method of claim 6, wherein said heat is applied by radiation from the exterior of said liner.
10. The method of claim 4, wherein said adhering step comprises the step of applying an adhesive between said member and said liner.
11. The method of claim 4,
wherein said member is disposed in a channel which is formed in said outer surface of said liner, and
wherein said adhering step comprises the steps of disposing said member in said channel, then radially compressing the liner so that said channel grips said member.
12. The method of claim 11, wherein said member comprises a cable.
13. The method of claim 11, wherein said member comprises a generally helical spring.
14. The method of claim 13, wherein said spring has a spring constant which is stiffer than a modulus of elasticity of said liner so that said liner is pulled by said member into said tubular without placing substantial additional strain on said liner.
15. The method of claim 11, wherein said member when in said channel is disposed fully inside said outer surface of said liner.
16. The method of claim 15, wherein said member is adhered to said liner sufficiently to remain in said channel.
17. The method of claim 11, wherein said member is adhered to said liner sufficiently to remain in said channel.
18. The method of claim 11, further comprising the step of making said member of a sufficiently strong material to resist deformation of said channel due to increased pressure in said liner bore.
19. The method of claim 11, further comprising the step of making said member of a sufficiently strong material to resist deformation of said channel due to thermal softening of said

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IPEA/US 11 SEP 2000

34. The method of claim 31, wherein said tubular system is assembled by the steps of:
placing a predetermined initial stress on said liner so as to induce a strain;
then adhering said liner to at least one elongated member; and
then pulling on said member, so that said liner is pulled, along with said member, into said tubular without inducing substantial additional strain on said liner.
35. A method of assembling a tubular system,
the tubular system comprising a tubular; a liner in the tubular, the liner having an outer wall engaging an inner wall of the tubular, the liner having an inner wall defining a hollow bore; and at least one elongated member which is disposed between said liner and said tubular and defines a fluid flow passage between said liner and said tubular;
said method comprising the steps of:
placing said liner and said member in contact with each other;
while said liner and said member remain in contact, pulling said liner into said tubular.
36. The method of claim 35, wherein said contact between said elongated member and said liner protects said elongated member from deformation while being pulled into said tubular.
37. The method of claim 36, wherein said elongated member comprises a communications cable.
38. The method of claim 36, wherein said elongated member comprises a heating cable.
39. The method of claim 36, wherein said elongated member comprises a force-sensing cable.
40. The method of claim 36, wherein said elongated member comprises an electrical or fluid-carrying conduit.
41. The method of claim 36,
wherein said member is disposed in a channel which is formed in said outer surface of said liner, and
wherein said adhering step comprises the steps of disposing said member in said channel, then compressing said channel so that said channel grips said elongated member.
42. The method of claim 41, wherein said member and liner are pulled into said tubular with said channel still compressed.

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IPEA/US 11 SEP 2000

43. The method of claim 41, wherein said channel is compressed by radially compressing said liner.

44. The method of claim 43, wherein said member and said liner are pulled into said tubular with said liner still compressed.

45. The method of claim 11, wherein said member and said liner are pulled into said tubular with said liner still compressed.

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To: JAMES A. FINDER
OSTROLENK, FABER, GERB & SOFFEN, LLP
1180 AVENUE OF THE AMERICAS
NEW YORK NY 10036

RECEIVED
APR 17 2000

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT
OR THE DECLARATION

(PCT Rule 44.1)

OFGS FILE No. P/3501-3

JAF

11, June 2000

PCT

PATENTS ORDERED

LG

Date of Mailing
(day/month/year)

11 APR 2000

Applicant's or agent's file reference
P/3255-26

FOR FURTHER ACTION See paragraphs 1 and 4 below

International application No.
PCT/US99/16968

International filing date
(day/month/year)
28 JULY 1999

Applicant
SAFETYLINER SYSTEMS, LLC

1. ☒ The applicant is hereby notified that the international search report has been established and is transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

When? The time limit for filing such amendments is normally 2 months from the date of transmittal of the international search report; however, for more details, see the notes on the accompanying sheet.

Where? Directly to the International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland
Facsimile No.: (41-22) 740.14.35

For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.

3. ☐ With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. Further action(s): The applicant is reminded of the following:

Shortly after 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in rules 90 bis 1 and 90 bis 3, respectively, before the completion of the technical preparations for international publication.

Within 19 months from the priority date, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later).

Within 20 months from the priority date, the applicant must perform the prescribed acts for entry into the national phase before all designated Offices which have not been elected in the demand or in a later election within 19 months from the priority date or could not be elected because they are not bound by Chapter II.

Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer

ANDRES KASHNIKOW *Diary Smith*
Andr. Kashnikoff 308-1137

Telephone No. (703) 308-0861

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference P/3255-26	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5	
International application No. PCT/US99/16968	International filing date (<i>day/month/year</i>) 28 JULY 1999	(Earliest) Priority Date (<i>day/month/year</i>) 28 JULY 1998
Applicant SAFETYLINER SYSTEMS, LLC		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. ☐ Certain claims were found unsearchable (See Box I).

2. ☐ Unity of invention is lacking (See Box II).

3. ☐ The international application contains disclosure of a nucleotide and/or amino acid sequence listing and the international search was carried out on the basis of the sequence listing

☐ filed with the international application.
☐ furnished by the applicant separately from the international application.

☐ but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.

☐ transcribed by this Authority.

4. With regard to the title,

☒ the text is approved as submitted by the applicant.
☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

☐ the text is approved as submitted by the applicant.
☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is:

Figure No. 4a

☒ as suggested by the applicant.
☐ because the applicant failed to suggest a figure.
☐ because this figure better characterizes the invention.

☐ None of the figures.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US99/16968

Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

The technical features mentioned in the abstract do not include a reference sign between parentheses (PCT Rule 8.1(d)).

A tubular system made up of a tubular (10), a liner (12) in the tubular (10), and longitudinally oriented members (15, 16, and 17), which may be disposed within the channels in the liner. The members advantageously may be used for pulling a liner into a host tubular, and/or for maintaining the structural strength of the liner (12). The members are continuous along the length of the plastic-lined tubular (10), and if applicable, through intermediary joints. The channels may be in the inner and/or outer surfaces of the liner (12). The members may be usable for carrying electrical current or signals, fiberoptic signals, or data communications; for heating the liner; and/or for detecting faults in the liner and/or the host tubular (10).

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US99/16968

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : F16L 11/00, 9/00, 55/16, 09/18

US CL : 138/97, 114, 140, 174

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 138/97, 114, 140, 174

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WEST 12

search terms: pipe, conduit, tube, liner, channels, subconduits, method, pulling

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2,280,140 A (WILSON) 21 April 1942, see entire document	1-35
Y, P	US 5,794,662 A (ST. ONGE et al.) 18 August 1998, column 3, lines 4-5, 55-60	1-20, 31-35
Y	US 3,526,086 A (MORGAN) 01 September 1970, see entire document	21-35
Y	US 4,529,009 A (HORNER et al.) 16 July 1985, see entire document	1-35

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
A document defining the general state of the art which is not considered to be of particular relevance	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
E earlier document published on or after the international filing date	*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*A* document member of the same patent family
O document referring to an oral disclosure, use, exhibition or other means	
P document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

25 FEBRUARY 2000

Date of mailing of the international search report

11 APR 2000Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer

ANDRES KASHNIKOV *Diane Smith*

Telephone No. (703) 308-0861

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

To:

FINDER, James, A.
Ostrolenk, Faber, Gerb & Soffen,
LLP
1180 Avenue of the Americas
New York, NY 10036
ÉTATS-UNIS D'AMÉRIQUE

OFGS FILE NO. P/3501-3

PATENTS ORDERED H/n

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

Date of mailing (day/month/year) 10 February 2000 (10.02.00)		IMPORTANT NOTICE	
Applicant's or agent's file reference P/3255-26			
International application No. PCT/US99/16968	International filing date (day/month/year) 28 July 1999 (28.07.99)	Priority date (day/month/year) 28 July 1998 (28.07.98)	
Applicant SAFETYLINER SYSTEMS, LLC et al			

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:
AU,CN,EP,IL,JP,KP,KR,US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:

AL,AM,AP,AT,AZ,BA,BB,BG,BR,BY,CA,CH,CU,CZ,DE,DK,EA,EE,ES,FI,GB,GE,GH,GM,HR,HU,ID,
IN,IS,KE,KG,KZ,LC,LK,LR,LS,LT,LU,LV,MD,MG,MK,MN,MW,MX,NO,NZ,OA,PL,PT,RO,RU,SD,SE,
SG,SI,SK,SL,TJ,TM,TR,TT,UA,UG,UZ,VN,YU,ZA,ZW

The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on
10 February 2000 (10.02.00) under No. WO 00/06933

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. (41-22) 740.14.35	Authorized officer J. Zahra Telephone No. (41-22) 338.83.38
--	---

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION CONCERNING
SUBMISSION OR TRANSMITTAL
OF PRIORITY DOCUMENT

(PCT Administrative Instructions, Section 411)

To:

OFGS FILE NO.

P/3501-3

FINDER, James, A.
Ostrolenk, Faber, Gerb & Soffen,
LLP
1180 Avenue of the Americas
New York, NY 10036
ÉTATS-UNIS D'AMÉRIQUE

PATENTS ORDERED

Am

JAF

Date of mailing (day/month/year) 22 December 1999 (22.12.99)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference P/3255-26	
International application No. PCT/US99/16968	
International publication date (day/month/year) Not yet published	
Applicant SAFETYLINER SYSTEMS, LLC et al	International filing date (day/month/year) 28 July 1999 (28.07.99) Priority date (day/month/year) 28 July 1998 (28.07.98)

- The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the International Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).
- This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.
- An asterisk(*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b). In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.
- The letters "NR" appearing in the right-hand column denote a priority document which was not received by the International Bureau or which the applicant did not request the receiving Office to prepare and transmit to the International Bureau, as provided by Rule 17.1(a) or (b), respectively. In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

<u>Priority date</u>	<u>Priority application No.</u>	<u>Country or regional Office or PCT receiving Office</u>	<u>Date of receipt of priority document</u>
28 July 1998 (28.07.98)	60/094,326	US	28 Sept 1999 (28.09.99)

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740.14.35

Authorized officer

Eugénia Santos

Telephone No. (41-22) 338.83.38

IN THE INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY
UNITED STATES PATENT AND TRADEMARK OFFICE

In re PCT International Application of:

Safetyliner Systems, LLC

Date: September 28, 2000

Int'l. Appln. No.: PCT/US99/16968

Int'l. Filing Date: 28 July 1999

For: ENHANCEMENT OF PROFILED TUBULAR LINING SYSTEMS
BY CHANNEL AUGMENTATION

Commissioner for Patents and Trademarks
Box PCT
Washington, D.C. 20231

VIA FACSIMILE: (703) 305-3230

RESPONSE TO FIRST WRITTEN OPINION

Sir:

A Written Opinion was issued August 28, 2000. However, the Written Opinion only addressed claims 1-35 originally filed with the application, not the full set of claims 1-45 currently in the application.

In an Article 19 Amendment filed June 12, 2000, claim 11 was amended and new claims 36-45 were added. The application was republished with the amended claims on August 10, 2000. Nevertheless, the Written Opinion did not address amended claim 11 or new claims 36-45.

The undersigned telephoned Examiner Kashnikow and sent him a copy of the amended claims by facsimile on September 8, 2000. The Examiner agreed that a new Written Opinion would have to be issued.

In a telephone contact on September 22, 2000, Ms. Eunice Price of the PCT Office advised the undersigned that the facsimile papers filed September 8, 2000 were a sufficient response to the first Written Opinion dated August 28, 2000, and that a new Written Opinion addressed to claims 1-45 would be issued.

In addition, the applicants offer the following comments on the first Written Opinion.

Patentable subject matter has been found in claims 4-20, 25, 26, 30 and 34.

Claims 1-3 and 35 were rejected as obvious in view of Wilson and Horner et al. Wilson relates to a fuel hose having an intermediate tubular member 18 with a plurality of grooves arranged on its outer surface for leak detection. Horner et al. relates to a cooling device for a beer dispenser. The beer dispenser has a bundle of secondary hoses which convey the beer which is cooled by water circulating in the passages 11. This bundle is surrounded by an outer cover 15. The cover is arranged on the bundle by sliding the cover onto the bundle. In order to make the sliding operation easier, the outer cover may be expanded radially.

There is no disclosure or suggestion in either Wilson or Horner et al. of pulling an inner liner and an elongated member simultaneously into a tubular as claimed in claim 1 and 35. The references would suggest instead a procedure of pulling an outer cover onto the inner members, but such a procedure would be impossible or at least not suggested with a tubular in the context of the present invention.

Claims 21-24 were rejected as anticipated by Foucras. Claims 27-29 and 31-33 were rejected as being obvious over Foucras in view of Louwagie et al. Foucras relates to an active heating system which uses a heating cable inserted between the pipe and the outer cover. Louwagie discloses means for monitoring the pressure locally in a pipe by measuring a pressure differential between the atmospheric pressure and the inner pressure using a pressure transducer, for example a strain gauge pressure sensor. Louwagie contains no suggestion, nor any means, of measuring pressure along a pipe in such a way as to locate a blockage. Louwagie may teach detecting an increase of pressure within the bore, and this in turn may indicate that a blockage exists, but nothing in Louwagie would make it possible to determine the location of the blockage as claimed.

In view of the foregoing, the Examiner is requested to reconsider his findings and issue a new Written Opinion.

I hereby certify that this correspondence is being
facsimile transmitted to the Patent and Trademark
Office on the date shown below




JAMES A. FINDER

Signature

September 28, 2000
Date

Respectfully submitted,



James A. Finder

Registration No.: 30,173

OSTROLENK, FABER, GERB & SOFFEN

1180 Avenue of the Americas

New York, New York 10036-8403

Telephone: (212) 382-0700

JAF:rb

PATENT COOPERATION TREATY

OFGS FILE No. P/3501-3
28 Sept 2000
PCT
PATENTS ORDERED LG

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To: JAMES A. FINDER
OSTROLENK, FABER, GERB & SOFFEN, LLP
1180 AVENUE OF THE AMERICAS
NEW YORK NY 10036

PCT
WRITTEN OPINION

(PCT Rule 66)

AUG 30 2000

Date of Mailing
(day/month/year)

28 AUG 2000

Applicant's or agent's file reference
P/3501-3

REPLY DUE within ONE months
from the above date of mailing

International application No.
PCT/US99/16968

International filing date (day/month/year)
28 JULY 1999

Priority date (day/month/year)
28 JULY 1998

International Patent Classification (IPC) or both national classification and IPC
IPC(7): F16L 11/00, 9/00, 55/16, 09/18 and US Cl.: 138/97, 114, 140, 174, 111

Applicant
SAFETYLINER SYSTEMS, LLC

1. This written opinion is the first (first, etc.) drawn by this International Preliminary Examining Authority.
2. This opinion contains indications relating to the following items:
 - I ☒ Basis of the opinion
 - II ☐ Priority
 - III ☐ Non-establishment of opinion with regard to novelty, inventive step or industrial applicability
 - IV ☐ Lack of unity of invention
 - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
 - VI ☐ Certain documents cited
 - VII ☐ Certain defects in the international application
 - VIII ☐ Certain observations on the international application
3. The applicant is hereby invited to reply to this opinion.

When? See the time limit indicated above. ~~The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.2(d).~~

How? By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

Also For an additional opportunity to submit amendments, see Rule 66.4.
For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4 bis.
For an informal communication with the examiner, see Rule 66.6.

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion.
4. The final date by which the international preliminary examination report must be established according to Rule 69.2 is: **28 NOVEMBER 2000**

Name and mailing address of the IPEA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer

ANDRES KASHNIKOW *Diane [signature]*

Telephone No. (703) 308-0861

Form PCT/IPEA/408 (cover sheet) (July 1998)*

Phone 308-1137
Fax 305-3588

WRITTEN OPINION

International application No.

PCT/US99/16968

I. Basis of the opinion

1. With regard to the elements of the international application:*

- ☒ the international application as originally filed
- ☒ the description:
 pages 1-13, as originally filed
 pages NONE, filed with the demand
 pages NONE, filed with the letter of _____
- ☒ the claims:
 pages 14-18, as originally filed
 pages NONE, as amended (together with any statement) under Article 19
 pages NONE, filed with the demand
 pages NONE, filed with the letter of _____
- ☒ the drawings:
 pages 1-14, as originally filed
 pages NONE, filed with the demand
 pages NONE, filed with the letter of _____
- ☒ the sequence listing part of the description:
 pages NONE, as originally filed
 pages NONE, filed with the demand
 pages NONE, filed with the letter of _____

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
 These elements were available or furnished to this Authority in the following language _____ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the written opinion was drawn on the basis of the sequence listing:

- ☐ contained in the international application in printed form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☒ The amendments have resulted in the cancellation of:

- ☒ the description, pages NONE
- ☒ the claims, Nos. NONE
- ☒ the drawings, sheets/fig NONE

5. ☐ This opinion has been drawn as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed".

WRITTEN OPINION

International application No.

PCT/US99/16968

V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. statement**

Novelty (N)	Claims <u>1-20 and 25-35</u>	YES
	Claims <u>21-24</u>	NO
Inventive Step (IS)	Claims <u>4-20, 25, 26, 30, 34</u>	YES
	Claims <u>1-3, 21-24, 27-29, 31-33, 35</u>	NO
Industrial Applicability (IA)	Claims <u>1-35</u>	YES
	Claims <u>NONE</u>	NO

2. citations and explanations

Claims 1-3 and 35 lack an inventive step under PCT Article 33(3) as being obvious over Wilson in view of Horner et al.

The patent to Wilson discloses a tubular system comprising a tubular 17 and a liner 18 having a plurality of channels 19 in the tubular in which the outer wall of the liner engages the inner wall of the tubular (see Figure 4) and the liner 18 having a hollow bore 16. Wilson does not disclose at least one elongated member disposed between the liner and the tubular and the method of assembling as recited. The patent to Horner teaches a hose having a plurality of elongated conduit members 14 disposed between a liner 10 and a tubular 15 in which the hose is assembled sliding the tubular 15 over the liner 10 and members 14. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the device of Wilson by incorporating at least elongated member between the tubular and the liner and to have assembled the device by pulling the tubular over the liner and elongated members as taught by Horner et al. in order to assemble a tubular system. Horner et al. does not disclose pulling the liner and member into the tubular. It would have been a matter of design choice to pull the liner and member into the tubular as opposed to pulling the tubular over the liner and member as taught by Horner et al., since there is no significant improvement in pulling the liner and member into the tubular over pulling the tubular over the liner and member as they will both carry out the same function.

Claims 21-24 lack novelty under PCT Article 33(2) as being anticipated by Foucras.

The patent to Foucras shows a tubular system having a host tubular 3, a liner 1 in the tubular 3 in which the outer wall of the liner 1 engages the inner wall of the tubular 3, a hollow bore in the liner 1, and polymer covered electrically conductive elongated wires 2 (Column 2, Lines 61-63) disposed between the tubular 3 and the liner 1 (Figure 2) to provide (Continued on Supplemental Sheet.)

WRITTEN OPINION

International application No.

PCT/US99/16968

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Boxes I - VIII

Sheet 10

TIME LIMIT:

The time limit set for response to a Written Opinion may not be extended. 37 CFR 1.484(d). Any response received after the expiration of the time limit set in the Written Opinion will not be considered in preparing the International Preliminary Examination Report.

V. 2. REASONED STATEMENTS - CITATIONS AND EXPLANATIONS (Continued):

heating for keeping the temperature of a fluid constant. As shown in Figure 2, the heating elements 2 penetrate the surface of the liner 1, thus indicating channels formed on the surface of liner 1 in which the heating elements 2 are inserted.

Claims 27-29 and 31-33 lack an inventive step under PCT Article 33(3) as being obvious over Foucras in view of Louwagie et al.

The patent to Foucras discloses the claimed invention except for the pressure sensing member to indicate location of a blockage. The patent to Louwagie et al. teaches using a pressure sensor 50 which senses the differential pressure across a pipe 4 (Column 4, Lines 60-63) through a strain gauge pressure sensor 52. A sudden rise in pressure at a particular location along the pipe can indicate a blockage at that location. The circuitry can be one or more optical fibers (Column 13, Lines 14-16). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the device of Foucras by incorporating strain gauge pressure sensors and optical fibers in the circuitry in order to measure pressure differentials across the pipe as taught by Louwagie et al. in to detect blockages along the pipe and their locations.

Claims 4-20, 25, 26, 30, and 34 meet the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest the step of placing a predetermined initial stress on the liner to induce a strain and pulling the member so that the liner is pulled along with the member without inducing substantial additional strain on the liner.

----- NEW CITATIONS -----

US 4,038,519 A (FOUCRAS) 26 JUNE 1977, see column 1, lines 66-68 and column 2, lines 43-64.

US 5,606,513 A (LOUWAGIE et al.) 25 FEBRUARY 1997, see column 4, lines 59-67.

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITYTo: JAMES A. FINDER
OSTROLENK, FABER, GERB & SOFFEN, LLP
1180 AVENUE OF THE AMERICAS
NEW YORK NY 10036

PCT

WRITTEN OPINION

(PCT Rule 66)

Date of Mailing
(day/month/year)

13 OCT 2000

Applicant's or agent's file reference
P/3501-3

REPLY DUE

within ONE months
from the above date of mailing

International application No.

PCT/US99/16968

International filing date (day/month/year)

28 JULY 1999

Priority date (day/month/year)

28 JULY 1998

International Patent Classification (IPC) or both national classification and IPC
IPC(7): F16L 11/00, 9/00, 55/16, 9/18 and US Cl.: 138/97, 114, 140, 174, 111

Applicant

SAFETYLINER SYSTEMS, LLC

1. This written opinion is the first (first, etc.) drawn by this International Preliminary Examining Authority.

2. This opinion contains indications relating to the following items:

- I ☒ Basis of the opinion
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step or industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

3. The applicant is hereby invited to reply to this opinion.

When? See the time limit indicated above. ~~The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.3(d).~~

How? By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

Also For an additional opportunity to submit amendments, see Rule 66.4. For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4 bis. For an informal communication with the examiner, see Rule 66.6.

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion.

4. The final date by which the international preliminary examination report must be established according to Rule 69.2 is: 28 NOVEMBER 2000Name and mailing address of the IPEA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Authorized officer

ANDRES KASHNIKOW

WRITTEN OPINION

International application No.

PCT/US99/16968

I. Basis of the opinion

1. With regard to the elements of the international application:*

- ☐ the international application as originally filed
- ☒ the description:
pages (See Attached) , as originally filed
pages , filed with the demand
pages , filed with the letter of
- ☒ the claims:
pages (See Attached) , as originally filed
pages , as amended (together with any statement) under Article 19
pages , filed with the demand
pages , filed with the letter of
- ☒ the drawings:
pages (See Attached) , as originally filed
pages , filed with the demand
pages , filed with the letter of
- ☒ the sequence listing part of the description:
pages (See Attached) , as originally filed
pages , filed with the demand
pages , filed with the letter of

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language _____ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the written opinion was drawn on the basis of the sequence listing:

- ☐ contained in the international application in printed form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☒ The amendments have resulted in the cancellation of:

- ☒ the description, pages NONE
- ☒ the claims, Nos. NONE
- ☒ the drawings, sheets/fig. NONE

5. ☐ This opinion has been drawn as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

* Documents drawn up by the International Searching Authority in response to an invitation under Article 14 are referred to

WRITTEN OPINION

International application No.

PCT/US99/16968

V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. statement

Novelty (N)

Claims	<u>(Please See supplemental sheet)</u>	YES
Claims	<u>(Please See supplemental sheet)</u>	NO

Inventive Step (IS)

Claims	<u>(Please See supplemental sheet)</u>	YES
Claims	<u>(Please See supplemental sheet)</u>	NO

Industrial Applicability (IA)

Claims	<u>(Please See supplemental sheet)</u>	YES
Claims	<u>(Please See supplemental sheet)</u>	NO

2. citations and explanations

Claims 1-3 and 35-40 lack an inventive step under PCT Article 33(3) as being obvious over Wilson in view of Horner et al.

The patent to Wilson discloses a tubular system comprising a tubular 17 and a liner 18 having a plurality of channels 19 in the tubular in which the outer wall of the liner engages the inner wall of the tubular (see Figure 4) and the liner 18 having a hollow bore 16. Wilson does not disclose at least one elongated member disposed between the liner and the tubular and the method of assembling as recited. The patent to Horner et al. teaches a hose having a plurality of elongated conduit members 41 disposed between a liner 42 and a tubular 44 in which the hose is assembled by sliding the tubular 44 over the liner 42 and members 41. Because of the sliding contact between the members 41 and liner 42, the members will be protected against deformation when pulled. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the device of Wilson by incorporating at least elongated member between the tubular and the liner and to have assembled the device by pulling the tubular over the liner and elongated members and providing a sliding contact between the tubular and liner in order to prevent deformation of the tubular as taught by Horner et al. in order to assemble a tubular system. Horner et al. does not disclose pulling the liner and member into the tubular. It would have been a matter of design choice to pull the liner and member into the tubular as opposed to pulling the tubular over the liner and member as taught by Horner et al., since there is no significant improvement in pulling the liner and member into the tubular over pulling the tubular over the liner and member as they will both carry out the same function. The elongated member comprising a communications cable, a heating cable, a force-sensing cable, or an electrical or fluid carrying conduit is strictly intended use.

Claims 21-24 lack novelty under PCT Article 33(2) as being anticipated by Fournas.
(Continued on Supplemental Sheet.)

WRITTEN OPINION

International application No.

PCT/US99/16968

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient).

Continuation of: Boxes I - VIII

Sheet 10

TIME LIMIT:

The time limit set for response to a Written Opinion may not be extended. 37 CFR 1.484(d). Any response received after the expiration of the time limit set in the Written Opinion will not be considered in preparing the International Preliminary Examination Report.

I. BASIS OF OPINION:

This opinion has been drawn on the basis of the description:

page(s) 1-13, as originally filed.

page(s) NONE, filed with the demand.

and additional amendments:

NONE

This opinion has been drawn on the basis of the claims:

page(s) 14-18, as originally filed.

page(s) NONE, as amended under Article 19.

page(s) NONE, filed with the demand.

and additional amendments:

Pages 19-21, filed with letter of 11 September 2000.

This opinion has been drawn on the basis of the drawings:

page(s) 1-14, as originally filed.

page(s) NONE, filed with the demand.

and additional amendments:

NONE

This opinion has been drawn on the basis of the sequence listing part of the description:

page(s) NONE, as originally filed.

pages(s) NONE, filed with the demand.

and additional amendments:

NONE

V. 1. REASONED STATEMENTS:

The opinion as to Novelty was positive (YES) with respect to claims 1-20 and 25-45.

The opinion as to Novelty was negative (NO) with respect to claims 21-24.

The opinion as to Inventive Step was positive (YES) with respect to claims 4-20, 25, 26, 30, 34, and 41-45.

The opinion as to Inventive Step was negative (NO) with respect to claims 1-3, 21-24, 27-29, 31-33, and 35-40.

The opinion as to Industrial Applicability was positive (YES) with respect to claims 1-45.

The opinion as to Industrial Applicability was negative (NO) with respect to claims NONE.

V. 2. REASONED STATEMENTS - CITATIONS AND EXPLANATIONS (Continued):

The patent to Foucras shows a tubular system having a host tubular 3, a liner 1 in the tubular 3 in which the outer wall of the liner 1 engages the inner wall of the tubular 3, a hollow bore in the liner 1, and polymer covered electrically conductive elongated wires 2 (Column 2, Lines 61-63) disposed between the tubular 3 and the liner 1 (Figure 2) to provide heating for keeping the temperature of a fluid constant. As shown in Figure 2, the heating elements 2 penetrate the surface of the liner 1, thus indicating channels formed on the surface of liner 1 in which the heating elements 2 are inserted.

Claims 27-29 and 31-33 lack an inventive step under PCT Article 33(3) as being obvious over Foucras in view of Louwagie et al.

The patent to Foucras discloses the claimed invention except for the pressure sensing member to indicate location of a blockage. The patent to Louwagie et al. teaches using a pressure sensor 50 which senses the differential pressure across a pipe 4 (Column 4, Lines 60-63) through a strain gauge pressure sensor 52. A sudden rise in pressure at a particular location

WRITTEN OPINION

International application No.

PCT/US99/16968

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Boxes I - VIII

Sheet 11

16). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the device of Foucras by incorporating strain gauge pressure sensors and optical fibers in the circuitry in order to measure pressure differentials across the pipe as taught by Louwagie et al. in to detect blockages along the pipe and their locations.

Claims 4-20, 25, 26, 30, 34, and 41-45 meet the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest the step of placing a predetermined initial stress on the liner to induce a strain and pulling the member so that the liner is pulled along with the member without inducing substantial additional strain on the liner and the adhering step of disposing the elongated member in the channel and then compressing the channel so that channel grips elongated member.

----- NEW CITATIONS -----

US 4,038,519 A (FOUCRAS) 26 JUNE 1977, see column 1, lines 66-68 and column 2, lines 43-64.

US 5,606,513 A (LOUWAGIE et al.) 25 FEBRUARY 1997, see column 4, lines 59-67.

P/3501-3

IN THE INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY
UNITED STATES PATENT AND TRADEMARK OFFICE

In re PCT International Application of:

Safetyliner Systems, LLC

Date: November 13, 2000

Int'l. Appln. No.: PCT/US99/16968

Examiner: D. Hwu

Int'l. Filing Date: 28 July 1999

Art Unit: 3752

For: ENHANCEMENT OF PROFILED TUBULAR LINING SYSTEMS
BY CHANNEL AUGMENTATION

Commissioner for Patents and Trademarks
Box PCT
Washington, D.C. 20231

VIA FACSIMILE: (703) 305-3230

RESPONSE TO SECOND WRITTEN OPINION

Sir:

A second Written Opinion was issued October 13, 2000.

In view of the claim amendments discussed below, replacement pages 14-20 containing claims 1-45 are enclosed herewith.

Patentable subject matter has been found in claims 4-20, 25, 26, 30, 34, and 41-45.

Claims 1-3 and 35-40 were rejected as being obvious in view of Wilson and Horner et al. In response, claims 1 and 35 are being amended to include patentable subject matter from claim 4 which is neither disclosed nor suggested by the cited art, namely the step of "pulling on said elongated member in order to pull said liner and said elongated member together into said tubular."

Therefore, patentable subject matter should be found in claims 1-3 and 35-40, in addition to claims 4-20 and 41-45.

Claims 21-24 were rejected as being anticipated by Foucras. In response, claim 21 is being amended to include patentable subject matter from claim 25, namely that "said

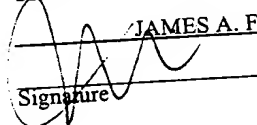
tubular system is assembled by the steps of securing said liner and at least one elongated member to each other; and then pulling on said member, so that said liner is pulled, along with said member, into said tubular." This feature is neither shown nor suggested by the cited art. Claim 26 is being rewritten in independent form. Therefore, patentable subject matter should be found in claims 21-24 in addition to claims 25 and 26.

Claims 27-29 and 31-33 were rejected as being obvious over Foucras in view of Louwagie et al. Claim 27 is being clarified slightly. Foucras relates to an active heating system which uses a heating cable inserted between the pipe and the outer cover. Louwagie discloses means for monitoring the pressure locally in a pipe by measuring a pressure differential between the atmospheric pressure and the inner pressure using a pressure transducer, for example a strain gauge pressure sensor. Louwagie contains no suggestion, nor any means, of detecting or determining the location of a blockage. The Examiner has not pointed out any portion of Louwagie containing such a disclosure. Louwagie may teach detecting an increase of pressure within the bore, but nothing in Louwagie would suggest, or make it possible, to determine and indicate the location of a blockage as claimed.

Therefore, patentable subject matter should be found in claims 27-29 and 31-33, in addition to claims 30 and 34.

In view of the foregoing, the Examiner is requested to reconsider his findings and issue a favorable International Preliminary Examination Report.

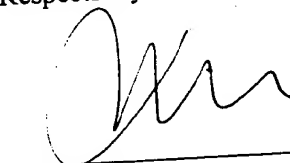
I hereby certify that this correspondence is being facsimile transmitted to the Patent and Trademark Office on the date shown below


Signature

JAMES A. FINDER

November 13, 2000
Date

Respectfully submitted,



James A. Finder
Registration No.: 30,173
OSTROLENK, FABER, GERB & SOFFEN
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WHAT IS CLAIMED IS:

1. A method of assembling a tubular system,
the tubular system comprising a tubular; a liner in the tubular, the liner having an outer wall engaging an inner wall of the tubular, the liner having an inner wall defining a hollow bore; and at least one elongated member which is disposed between said liner and said tubular and defines a fluid flow passage between said liner and said tubular;
said method comprising the steps of:
placing said liner and said member in contact with each other;
while said liner and said member are in contact, pulling on said elongated member in order to pull said liner and said elongated member together into said tubular.
2. The method of claim 1, wherein after said pulling step, said member is disposed between said outer liner surface and said tubular and thereby deforms said liner so as to define said fluid flow passage.
3. The method of claim 1, wherein said member is disposed in a channel which is formed in a surface of said liner.
4. The method of claim 1, further comprising the steps of:
placing a predetermined initial stress on said liner so as to induce a strain; and then adhering said liner and said member to each other;
wherein in said pulling step, said liner is pulled along with said member into said tubular without inducing substantial additional strain on said liner.
5. The method of claim 4, wherein said adhering step comprises the step of providing barbs on said member.
6. The method of claim 4, wherein said adhering step comprises the step of applying heat to said member.
7. The method of claim 6, wherein said adhering step further comprises the step of applying an adhesive between said member and said liner.

8. The method of claim 6, wherein said heat is applied by passing an electric current through said member.

9. The method of claim 6, wherein said heat is applied by radiation from the exterior of said liner.

10. The method of claim 4, wherein said adhering step comprises the step of applying an adhesive between said member and said liner.

11. The method of claim 4,
wherein said member is disposed in a channel which is formed in said outer surface of said liner, and

wherein said adhering step comprises the steps of disposing said member in said channel, then radially compressing the liner so that said channel grips said member.

12. The method of claim 11, wherein said member comprises a cable.

13. The method of claim 11, wherein said member comprises a generally helical spring.

14. The method of claim 13, wherein said spring has a spring constant which is stiffer than a modulus of elasticity of said liner so that said liner is pulled by said member into said tubular without placing substantial additional strain on said liner.

15. The method of claim 11, wherein said member when in said channel is disposed fully inside said outer surface of said liner.

16. The method of claim 15, wherein said member is adhered to said liner sufficiently to remain in said channel.

17. The method of claim 11, wherein said member is adhered to said liner sufficiently to remain in said channel.

18. The method of claim 11, further comprising the step of making said member of a sufficiently strong material to resist deformation of said channel due to increased pressure in said liner bore.

19. The method of claim 11, further comprising the step of making said member of a sufficiently strong material to resist deformation of said channel due to thermal softening of said liner.

20. The method of claim 11, further comprising the step of making said member of a sufficiently strong material to resist deformation of said channel due to swelling of said liner upon contact with materials in said liner bore.

21. A tubular system with internal heating, comprising:

a host tubular;

a liner in the tubular, the liner having an outer wall engaging an inner wall of the tubular, the liner having an inner wall defining a hollow bore; and

at least one electrically conductive elongated member disposed between said host tubular and said liner;

said liner comprising an electrical heating element connected to said at least one member for receiving electrical current from said member and thereby heating said tubular system;

wherein said tubular system is assembled by the steps of:

securing said liner and at least one elongated member to each other; and

then pulling on said member, so that said liner is pulled, along with said member, into said tubular.

22. The tubular system of claim 21, the liner having at least one channel formed therein, said member being disposed in said at least one channel.

23. The tubular system of claim 22, wherein said electrical heating element is a conductive polymer layer which has an electrical resistance and forms a part of said liner.

24. The tubular system of claim 22, wherein said electrical heating element is an electrically resistive wire disposed in said at least one channel.

25. The tubular system of claim 21, wherein said tubular system is further assembled by the steps of:

placing a predetermined initial stress on said liner so as to induce a strain; and

then pulling on said member, so that said liner is pulled, along with said member, into said tubular without inducing substantial additional strain on said liner.

26. A tubular system with internal heating, comprising:

a host tubular;

a liner in the tubular, the liner having an outer wall engaging an inner wall of the tubular, the liner having an inner wall defining a hollow bore; and

at least one electrically conductive elongated member disposed between said host tubular and said liner;

said liner comprising an electrical heating element connected to said at least one member for receiving electrical current from said member and thereby heating said tubular system;

wherein said member is adhered to said liner and has sufficient tensile strength to be usable to pull said liner into said tubular without inducing substantial strain in said liner.

27. A tubular system adapted for determining the location of a blockage therein, the tubular system comprising:

a tubular;

a liner in the tubular, the liner having at least one channel formed therein; an outer wall of the liner engaging an inner wall of the tubular; the liner having an inner wall defining a hollow bore; and

at least one elongated sensing member which is disposed in said at least one channel and is responsive to pressure in said hollow bore within said liner, and produces a pressure

signal which is indicative of said location of said blockage.

28. The tubular system of claim 27, wherein said elongated sensing member comprises an electrical strain gauge.

29. The tubular system of claim 27, wherein said elongated sensing member comprises at least one optical fiber.

30. The tubular system of claim 27, wherein said member is adhered to said liner and has sufficient tensile strength to be usable to pull said liner into said tubular without inducing substantial strain in said liner.

31. A method of determining the location of a blockage in a tubular system, the tubular system comprising:

a tubular; and

a liner in the tubular, the liner having at least one channel formed therein; an outer wall of the liner engaging an inner wall of the tubular; the liner having an inner wall defining a hollow bore; said method comprising the steps of:

placing at least one elongated sensing member in said at least one channel, said sensing member being responsive to pressure in said hollow bore within said liner, said pressure being indicative of said location of said blockage;

applying an input signal to said sensing member; and

receiving an output signal from said sensing member and processing said output signal to determine said location of said location of said blockage.

32. The method of claim 31, wherein said sensing member comprises an electrical strain gauge and said input and output signals are electrical.

33. The method of claim 31, wherein said sensing member comprises at least one optical fiber and said input and output signals are optical.

34. The method of claim 31, wherein said tubular system is assembled by the steps

of:

placing a predetermined initial stress on said liner so as to induce a strain;
then adhering said liner to at least one elongated member; and
then pulling on said member, so that said liner is pulled, along with said member, into said tubular without inducing substantial additional strain on said liner.

35. A method of assembling a tubular system,
the tubular system comprising a tubular; a liner in the tubular, the liner having an outer wall engaging an inner wall of the tubular, the liner having an inner wall defining a hollow bore; and at least one elongated member which is disposed between said liner and said tubular and defines a fluid flow passage between said liner and said tubular;
said method comprising the steps of:
placing said liner and said member in contact with each other;
while said liner and said member remain in contact, pulling on said elongated member in order to pull said liner and said member together into said tubular.

36. The method of claim 35, wherein said contact between said elongated member and said liner protects said elongated member from deformation while being pulled into said tubular.

37. The method of claim 36, wherein said elongated member comprises a communications cable.

38. The method of claim 36, wherein said elongated member comprises a heating cable.

39. The method of claim 36, wherein said elongated member comprises a force-sensing cable.

40. The method of claim 36, wherein said elongated member comprises an electrical or fluid-carrying conduit.

41. A method of assembling a tubular system,
the tubular system comprising a tubular; a liner in the tubular, the liner having an outer wall engaging an inner wall of the tubular, the liner having an inner wall defining a hollow bore; and at least one elongated member which is disposed between said liner and said tubular and defines a fluid flow passage between said liner and said tubular;

said method comprising the steps of:

placing said liner and said member in contact with each other;

while said liner and said member remain in contact, pulling said liner into said tubular;

wherein said contact between said elongated member and said liner protects said elongated member from deformation while being pulled into said tubular;

wherein said member is disposed in a channel which is formed in said outer surface of said liner, and

wherein said adhering step comprises the steps of disposing said member in said channel, then compressing said channel so that said channel grips said elongated member.

42. The method of claim 41, wherein said member and liner are pulled into said tubular with said channel still compressed.

43. The method of claim 41, wherein said channel is compressed by radially compressing said liner.

44. The method of claim 43, wherein said member and said liner are pulled into said tubular with said liner still compressed.

45. The method of claim 11, wherein said member and said liner are pulled into said tubular with said liner still compressed.

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

JAF
PCT

OFCS FILE No. P13501-3
25 June 2000
CORRECT DEFECTS ORDERED LG

To:
JAMES A. FINDER
OSTROLENK, FABER, GERB & SOFFEN, LLP
1180 AVENUE OF THE AMERICAS
NEW YORK, NY 10036

MAY 30 2000

INVITATION TO CORRECT
DEFECTS IN THE DEMAND

(PCT Rule 60.1)

Date of mailing (day month year) 25 MAY 2000	
Applicant's or agent's file reference P/3255-26	REPLY DUE within ONE MONTH from the above date of mailing. See also below.
International application No. PCT/US99/16968	International filing date (day month year) 28 JUL 99
Applicant SAFETYLINER SYSTEMS, LLC	

The applicant is hereby invited within the time limit indicated above to correct the following defects which this International Preliminary Examining Authority has found in the demand for international preliminary examination:

1. ☐ It does not contain the election of at least one Contracting State bound by Chapter II (Rules 53.2(a)(iv) and 53.7).
2. ☐ It does not permit identification of the international application to which it relates (Rule 60.1(b)).
3. ☐ It does not contain the required petition (Rules 53.2(a)(i) and 53.3).
4. ☐ It does not contain the required indications concerning the agent as specified in the Annex (Rules 53.2(a)(ii) and 53.5).
5. ☐ It does not contain the required indications concerning the international application as specified in the Annex (Rules 53.2(a)(iii) and 53.6).
6. ☐ It is not submitted in the required language which is: _____ (Rule 55.1).
7. ☐ It is not made on the printed form (Rule 53.1(a)).
8. ☐ It is presented as a computer print-out the particulars of which do not comply with the Administrative Instructions (Rule 53.1(a)).
9. ☒ It does not contain the required indications concerning the applicant as specified in the Annex (Rules 53.2(a)(ii) and 53.4).
10. ☐ It does not contain the required signature as specified in the Annex (Rules 53.2(b) and 53.8).

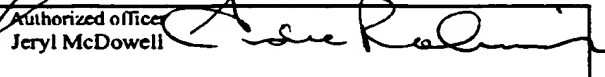
Effect of the date of receipt of the corrections on the date of receipt of the demand:

- (i) If the defects noted under items 1 and 2 are corrected within the time limit indicated above, the demand shall be considered as if it had been received on the date when the corrections are received (Rule 60.1(b)). If that date is later than the expiration of 19 months from the priority date, entry into the national phase before the elected Offices will NOT be postponed until the expiration of 30 months from the priority date.
- (ii) If the defects noted under items 3 to 10 are corrected within the time limit indicated above, the demand shall be considered as if it had been received on the actual filing date (Rule 60.1(b)).

Effect of failure to correct the defects within the time limit indicated above:

- (i) In the case of defects noted under items 1 to 8, this Authority will declare that the demand is considered as if it had not been submitted.
- (ii) In the case of defects noted under items 9 and 10, this Authority will declare that the election(s) of the State(s) concerned is(are) considered as if it(they) had not been made.

A copy of this invitation has been sent to the International Bureau.

Name and mailing address of the IPEA/ Assistant Commissioner for Patent Box PCT Washington, D.C. 20231 Attn: RO/US Facsimile No. 703-305-3230	Authorized officer Jeryl McDowell  Telephone No. 703-305-3639
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Form PCT/IPEA/404 (July 1998)

P/3501-3

IN THE INTERNATIONAL BUREAU OF WIPO

In re International Patent Application of

Safetyliner Systems, LLC

Date: June 12, 2000

Appln. No.: PCT/US99/16968

International Filing Date: July 28, 1999

For: ENHANCEMENT OF PROFILED TUBULAR LINING
SYSTEMS BY CHANNEL AUGMENTATION

International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

By Facsimile: 011-41-22-740.14.35

SUBMISSION OF ARTICLE 19 AMENDMENT

Sir:

In response to the International Search Report, which was transmitted on April 11, 2000, the applicants submit the following Art. 19 Amendment.

The amendment consists of replacement pages 15 and 18 and new page 19.
Claim 11 is being amended. New claim 45 which depends from claim 11 is being added.
Also, new claims 36-44 which depend from claim 35 are being added.

Entry is respectfully requested.

Respectfully submitted,



James A. Finder
OSTROLENK, FABER, GERB & SOFFEN
1180 Avenue of the Americas
New York, New York 10036-8403
Telephone: (212) 382-0700

JAF:ec

through said member.

9. The method of claim 6, wherein said heat is applied by radiation from the exterior of said liner.

10. The method of claim 4, wherein said adhering step comprises the step of applying an adhesive between said member and said liner.

11. The method of claim 4,
wherein said member is disposed in a channel which is formed in said outer surface of said liner, and

wherein said adhering step comprises the steps of disposing said member in said channel, then radially compressing the liner so that said channel grips said member.

12. The method of claim 11, wherein said member comprises a cable.

13. The method of claim 11, wherein said member comprises a generally helical spring.

14. The method of claim 13, wherein said spring has a spring constant which is stiffer than a modulus of elasticity of said liner so that said liner is pulled by said member into said tubular without placing substantial additional strain on said liner.

15. The method of claim 11, wherein said member when in said channel is disposed fully inside said outer surface of said liner.

16. The method of claim 15, wherein said member is adhered to said liner sufficiently to remain in said channel.

17. The method of claim 11, wherein said member is adhered to said liner sufficiently to remain in said channel.

18. The method of claim 11, further comprising the step of making said member of a sufficiently strong material to resist deformation of said channel due to increased pressure in said liner bore.

19. The method of claim 11, further comprising the step of making said member of a sufficiently strong material to resist deformation of said channel due to thermal softening of said

34. The method of claim 31, wherein said tubular system is assembled by the steps of:
placing a predetermined initial stress on said liner so as to induce a strain;
then adhering said liner to at least one elongated member; and
then pulling on said member, so that said liner is pulled, along with said member, into said tubular without inducing substantial additional strain on said liner.

35. A method of assembling a tubular system,
the tubular system comprising a tubular; a liner in the tubular, the liner having an outer wall engaging an inner wall of the tubular, the liner having an inner wall defining a hollow bore; and at least one elongated member which is disposed between said liner and said tubular and defines a fluid flow passage between said liner and said tubular;
said method comprising the steps of:
placing said liner and said member in contact with each other;
while said liner and said member remain in contact, pulling said liner into said tubular.

36. The method of claim 35, wherein said contact between said elongated member and said liner protects said elongated member from deformation while being pulled into said tubular.

37. The method of claim 36, wherein said elongated member comprises a communications cable.

38. The method of claim 36, wherein said elongated member comprises a heating cable.

39. The method of claim 36, wherein said elongated member comprises a force-sensing cable.

40. The method of claim 36, wherein said elongated member comprises an electrical or fluid-carrying conduit.

41. The method of claim 36,
wherein said member is disposed in a channel which is formed in said outer surface of said liner, and

wherein said adhering step comprises the steps of disposing said member in said channel, then compressing said channel so that said channel grips said elongated member.

42. The method of claim 41, wherein said member and liner are pulled into said tubular with said channel still compressed.

43. The method of claim 41, wherein said channel is compressed by radially compressing said liner.

44. The method of claim 43, wherein said member and said liner are pulled into said tubular with said liner still compressed.

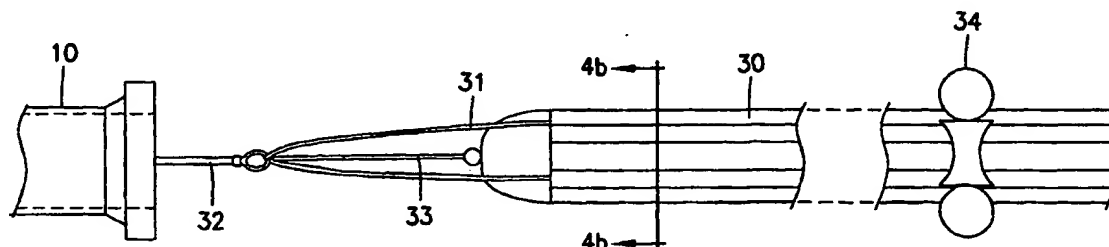
45. The method of claim 11, wherein said member and said liner are pulled into said tubular with said liner still compressed.



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : F16L	A2	(11) International Publication Number: WO 00/06933 (43) International Publication Date: 10 February 2000 (10.02.00)
(21) International Application Number: PCT/US99/16968 (22) International Filing Date: 28 July 1999 (28.07.99) (30) Priority Data: 60/094,326 28 July 1998 (28.07.98) US (71) Applicant (for all designated States except US): SAFETY-LINER SYSTEMS, LLC [US/US]; 27286 Jimmy Lane, Conroe, TX 77385 (US). (72) Inventors; and (75) Inventors/Applicants (for US only): TAYLOR, Jack, Curtis [US/US]; 27221 Kane Lane, Conroe, TX 77385 (US). ROACH, Max, Jerry [US/US]; 27286 Jimmy Lane, Conroe, TX 77385 (US). (74) Agents: FINDER, James, A. et al.; Ostrolenk, Faber, Gerb & Soffen, LLP, 1180 Avenue of the Americas, New York, NY 10036 (US).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>Without international search report and to be republished upon receipt of that report.</i>

(54) Title: ENHANCEMENT OF PROFILED TUBULAR LINING SYSTEMS BY CHANNEL AUGMENTATION

**(57) Abstract**

A tubular system made up of a tubular, a liner in the tubular, and longitudinally oriented members, which may be disposed within channels in the liner. The members advantageously may be used for pulling a liner into a host tubular, and/or maintaining the structural strength of the liner. The members are continuous along the length of the plastic-lined tubular, and if applicable, through intermediary joints. The channels may be in the inner and/or outer surfaces of the liner. The members may be usable for carrying electrical current or signals, fiberoptic signals, or data communications; for heating the liner; and/or for detecting faults in the liner and/or the host tubular.

FOR THE PURPOSES OF INFORMATION ONLY

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Enhancement of Profiled Tubular Lining Systems by Channel Augmentation

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is based on and claims priority from U.S. Provisional patent application 60/094,326 filed July 28, 1998, in the name of Jack C. Taylor.

This application is related to Serial No. 08/532,561 filed June 4, 1990, now U.S. Patent 5,072,622; and the following provisional applications, all filed in the name of Jack C. Taylor: Serial No. 60/093,665 filed July 22, 1998 and its corresponding PCT Intl. Appln. No. PCT/US99/_____, filed July 22, 1999; Serial No. 60/094,585 filed July 29, 1998; and Serial No. 60/138,814 filed June 14, 1999.

Some, but not all, of the aspects of the invention described herein have been filed under the USPTO Document Disclosure program by Jack C. Taylor, under reference numbers 403965 (August 28, 1996), 403966 (August 28, 1996), 413924 (July 21, 1997), 424712 (September 18, 1997), and 430792 (January 26, 1998).

The foregoing disclosures are incorporated by reference herein.

BACKGROUND OF THE INVENTION

Pipes and other tubulars have been lined with polymeric liners (e.g., polyethylene, nylon 11, etc.) for many years and several installation techniques are known to the art. These systems have been used principally in offshore and on shore pipelines, and in downhole production tubulars. Their scope has generally been limited to corrosion and erosion protection. However, they have also been used in monitoring for integrity of the composite liner-host system, as described in US Patent 5,072,622 (Roach & Whitehead).

Generally, the liner resides in close-tolerance with the host pipe along its length, forming a stable composite system, as shown in Fig. 1 which is, a cutaway end view of a tubular 10 with a liner 11. The installed liner may be either of a loose-fit or a compressed-fit variety, both well known to the art. In all but low pressure applications, the stresses induced by fluid pressure from within the liner are transmitted to the surrounding 'host' tubular, and resisted by the same. The liner acts as an intermediary layer.

SUMMARY OF THE INVENTION

The invention described herein expands the range of possible applications of liners through utilization of longitudinally oriented members possibly disposed within channels in the surface of

for continuity of the members along the length of the plastic-lined tubular, and if applicable, through intermediary joints.

The invention further provides for the channels to exist in the inner and/or outer surfaces of the liner.

The invention further relates to use of the members for carrying electrical current or signals, fiberoptic signals, and data communications; for heating the liner; and for detecting faults in the liner and/or the host tubular.

Other features and advantages of the invention will become apparent from the following description of embodiments thereof, which refers to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a cross-sectional view of a conventional line tubular.

Figs. 2a, 2b and 2c are respectively cross-sectional views of lined tubulars with members disposed in channels therein.

Figs. 3a, 3b and 3c are respectively isometric views of channeled liners.

Fig. 4a is a schematic elevation and Fig. 4b is a cross-section taken on line A-A in Fig. 4a, showing a liner and members being pulled into a host tubular.

Figs. 5a, 5b and 5c are schematic cross-sectional views showing respective stages in the insertion of a member into a liner and the liner into a host tubular.

Fig. 6 is a schematic cross-sectional view of a liner and member system with an internal plug for the liner.

Figs. 7a, 7b and 7c show members with respective surface enhancements contained in a channel.

Fig. 8a shows a cable not protruding from a liner channel and Fig. 8b shows a cable protruding from a liner channel.

Figs. 9a and 9b are cross sectional views of a host tubular and a liner, before and after an internal pressure increase.

Fig. 10 is a cross-sectional view of a member in a liner channel.

Fig. 11 is a schematic diagram showing system for insertion of a member into a channel.

Figs. 12a-12f are cross-sectional views showing various types of members accommodated in liner channels before (Figs. 12a, 12b and 12c) and after (Figs. 12d, 12e, 12f) an increase in liner bore pressure.

Fig. 13 shows a braided member in a liner channel.

Fig. 14 schematically illustrates a liner with a plurality of electrically conductive cable members, and conductive polymer heating elements for heating the liner.

Figs. 15a and 15b are cross-sectional views showing respective examples of conductive polymer heating elements.

Figs. 16a, 16b and 16c, 16d and 17 are isometric and cross-sectional views showing differential stresses applied to cable members, Figs. 16a-16d showing a strain gauge cable and Fig. 17 showing a fiber optic cable.

Figs. 18a and 18b show an embodiment comprising conductive members disposed on a non-channeled liner within a host tubular.

Fig. 19 schematically illustrates an alternate embodiment with electrically conductive cable members and tracing cable heating elements in the liner.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

Figs. 2a-2c are cross-sectional views of a tubular 10, respective liners 12, 13 and 14, channels formed in the liners, and members disposed in the channels. In Fig. 2a the member 15 is a bar or wire, the member 16 is a cable, and the member 17 is part-cylindrical in cross-section. In Fig. 2b the member 18 comprises a pair of wires, the member 19 is a bar, and the member 20 is horseshoe-shaped. In Fig. 2c, six channels all have different shapes, five are formed on the outside surface of the liner 14 and one is formed on the inside surface of the liner 14.

Fig. 3a shows a liner 21a with four straight longitudinal channels 22. Fig. 3b shows a liner 21b with two parallel helical channels 23 and 24. Fig. 3c shows a liner 21c with one straight channel 25 and two intersecting helical channels 26 and 27.

Thus, the members are located within one or more channels. In a preferred embodiment the channels are axially oriented. Equally, however, they may have wave shapes, radial, winding, or other nonlinear aspects. The channels need not be parallel, i.e., overlaps and inconsistent spacing between channels are permitted.

The shapes of the channels may vary. The shapes are advantageously coordinated with those of the corresponding members. For example, if the member to be disposed in a channel is rounded, such as a cable, a preferred embodiment of the channel cross-section is semicircular, as seen in Fig. 2a. Notwithstanding, channel profiles that are dissimilar to the member(s) are permissible, provided functionality of the system is maintained (per **Figs. 2b & 2c**).

Not all channels need to be of identical geometry. To accommodate differently sized and shaped members, the channels may have different corresponding cross-sections (per **Fig. 2c**).

Not all channels need contain members. Although several channels may be present in the inner and/or outer surface of the liner, only a portion of those need contain members (per **Fig. 2c**).

Not all members utilized in a liner need be identical in geometry or construction. As explained below, individual members may have different functions, so that the respective members may provide different corresponding benefits to the system. Thus, a variety of member types may be introduced into a single liner (per **Figs. 2a-2c**).

Current liner systems are normally inserted into a host tubular by applying a tensile load from one end, e.g., pull-cables, or gravity weights. Further, individual installation segment lengths

have been limited by the mechanical properties of the liner. Tensile loads, totally borne by the liner, continually climb throughout the insertion process. Accumulation of drag is generally proportional to distance pulled, and all the force is applied to the leading end of the liner. As a general rule, polyethylene liners are installed after temporarily reducing their overall diameter. For example, the known Titeliner™, system passes the liner through rollers before insertion into the tubular, while the Swageliner™, system passes the liner through a tapered die. The tensile load on the liner holds it contracted until the tension is released. With such systems, installation lengths tend to average 2500 ft., and the maximum permissible length is approximately 5000 feet. If longer lengths were attempted, the liner would simply be pulled apart.

The invention, however, extends the maximum permissible pull length. Lower installation cost is achieved, as fewer insertion operations will be involved in any multiple sectioned line. Another benefit is being able to insert a liner over long distances, into those lines where sectioning into short distances is impractical, or impossible; e.g., water crossings, restricted rights-of-way.

To effect this benefit, both the member and the liner are pulled into the host pipe together. Figs. 4a is a schematic elevation sketch of a liner 30 and members 31 fastened together, being pulled toward the host tubular 10. Fig. 4b is a cross-section taken on line A-A in Fig. 4a. The members 31 are pulled in common by an insertion pulling cable 32. Optionally, the liner 30 may be pulled in addition by a liner pulling cable 33 connected to the cable 32. The members 31 share the longitudinal force and resultant stresses applied to liner 30. To derive this benefit, the member(s) must have higher unit tensile resistance properties than the liner. Accordingly, the overall resistance to stress is greater than that of the liner alone. Each member is positioned in a channel prior to the liner's insertion into the host tubular. They are then affixed to the liner by one of several methods, discussed below. Shear stress resistance at the plane between the liner and the member is sufficient to allow the two materials to, mechanically, behave in a composite fashion; the strain is equivalent.

In the disclosed embodiment, the liner 30 is inserted into the host tubular 10 after reducing its diameter with a four-roller assembly 34, which is known to the art. A member 40, sized for a close tolerance fit to the corresponding channel 42 (per Fig. 5a), is positioned in its respective channel prior to the diametric reduction step. The member 40 is a cable in this embodiment.

It is highly preferable to preserve the general shape of the liner 30 to best preserve its integrity when using this technique. Fig. 6 is a cutaway elevation of a liner and member system with an internal plug 43 to maintain the liner's round shape. Notwithstanding, the liner and member can be inserted with fold and form technologies, also known to the art, e.g., U-Liner®, where such care is unnecessary. In such a system the liner is folded into a U-shaped cross-section before insertion, and after insertion is expanded with heat and internal pressure, or with internal pressure alone.

As the liner 30, now containing the member 40, is reduced in diameter as it is drawn through the apparatus 34, stresses of the reduction process will attempt to reduce the channel cross-section

(per **Fig. 5b**). However, the member resists this effect, and becomes affixed to the liner due to compression, while the liner is reduced in diameter, throughout the entire insertion process.

The degree of affixation can be further enhanced by surface enhancements of the member. For example, a member 43 can be constructed with a barbed or knurled surface (per **Fig. 7a**). And when the liner 44 is compressed upon it, these irregularities indent themselves into the liner (**Fig. 7b**), thus providing more resistance to differential movement. As an extension of this example, the member may be heated to cause the liner to melt locally, where it contacts the member. This would further ensure penetration of the member's surface irregularities. Upon solidification of the melted polymer, the two would be effectively bonded. Further on this theme, a member 45 may be impregnated with a compound which adheres to the liner material, either under contact pressure, or at elevated temperatures (per **Fig. 7c**). Also, the channel itself may have such compound 46 loaded into it prior to the member's insertion. Any, or a combination of these will further enhance the effective bond between the liner and the member, beyond the bond provided merely by radial compression as described in the preceding paragraph.

If the member and liner are not effectively adhered, the liner may be subjected to the entire tensile load, allowing failure during installation from over-stressing. Adequately affixing the member to the liner, i.e., minimizing slip at the boundary layer between the two, however, assures that the stresses are resisted incrementally along the length of the liner. This results in the tensile load of insertion being carried by both the liner and the member, with corresponding strain rates being thereby equalized. In combination, the two are able to resist greater installation loads than the liner alone, permitting longer distances to be lined.

The liner is thus not permitted to be over-stretched to the point of plastic failure; unable to recover sufficient strain upon unloading. With the strain limited to an acceptable level within the liner's elastic behavior parameters, the liner can spontaneously expand radially to the desired close-tolerance fit within the host tubular (per **Fig. 5c**), after the insertion stress is released.

Thus, the channels provide effective protection for both the host tubular and the member. See **Fig. 8a** and **Fig. 8b**, which are cutaway elevations of members recessed within channels located in the outer surface of the liner. With sufficient channel depth, and/or diametric reduction induced 'clamping' it is possible and preferable for the outer surface of the member not to protrude beyond the outer surface of the liner. Take, for example, the case of a member which is a steel cable. Unsheltered cables, particularly of small effective diameters, can cause excessive point wear on the host tubular during installation, particularly at bends (see **Fig. 8b**). Alternatively, the cable could fray prematurely due to friction with a host steel tubular. These concerns are mitigated when a member, in this case a cable, is effectively hidden and affixed within a channel (see **Fig. 8a**).

With the invention, the member(s) can be recovered, for reuse, for example. When the liner is inserted by the diametric reduction techniques, and subsequently the tension is released, it spontaneously expands radially. Concurrently, due to the geometry change, the clamping/adhesion

experienced by the member within the channel, is relaxed (per **Fig. 5c**). Resistance to shear between the member and liner is greatly reduced. After the liner has been secured in position within the host tubular, tensile force can be applied to the member alone, pulling it through its channel, and out of the lined tubular system.

If the aforementioned process has used heat, i.e., melting and solidification (as in **Fig. 7c**), to improve adhesion, the process can be reversed. In the case of a cable, electric power can be fed once again through the cable, heating up the liner and/or bonding layer, thus freeing the member for withdrawal while the polymer is melted.

If the aforementioned process has used barbs to gain improved adhesion, the orientation of the barbs within the channels can be so arranged that upon release from compression the barbs can be withdrawn readily (per **Fig. 7b**), thus releasing the cable from the liner.

Figs. 18a and 18b show an alternate embodiment wherein a non-channeled liner 100 is inserted in a tubular 102. Adhered to the liner 100 are elongated members 104, 106, which may be electrically conductive and/or resistive if desired (see **Fig. 19** below), in addition to having the mechanical characteristics mentioned above. In this example, member 104 is secured to the liner by an adhesive or heat, for example, while the member 106 is secured to the liner by barbs. As shown in **Fig. 18b**, after pressurization the liner 100 engages the tubular 102 and the members 104, 106 deform the liner 100, thereby defining fluid flow passages.

The advantages of the embodiment of **Figs. 18a and 18b** are the same as those described above.

One of the most important benefits of the invention is that of extending the functional limits of the channels themselves, i.e., expanding the window of allowable operating conditions in which the channels can be used to improve the longevity of a given liner material. In the Roach & Whitehead patent, liner grooves are used in a monitoring and leak detection system. In other patent disclosures filed by the current inventor, channels are used to vent annular fluid to mitigate liner collapse potential, due for example to pressure imbalances, at line shutdown for example. Their effectiveness in these applications is limited by the properties and performance of the materials under the given operating conditions, however. In general, increased pressure will hasten the collapse of the channels, and thus reduce the cross-sectional area of the annular passage surrounding the liner, within the host pipe. This effect is compounded by temperature, as the liner material both softens and expands; reducing resistance to collapse, and expanding to fill the void of the channel itself. See **Figs. 9a and 9b**, which are end cutaway sections of channeled liner 50 in a host 10, before and after the channel 51 contracts due to material expansion. Yet another deleterious effect, particularly for polyethylene liners in hydrocarbon service, is liner material swelling when it reacts upon contact with the fluid carried in the liner bore. This has the same effect as temperature, softening the material and causing it to expand; both detrimental to the geometry and function of the channel for the application.

However, members installed in channels can act as supports to resist the cross-sectional area reduction. See Fig. 10, which is a cutaway end section of a member 52 in a liner channel 51. Preferred embodiments of the members in this case are cables, and/or helical springs.

Installation of either cables or spring members is readily accomplished. In one embodiment they are paid off a reel 53 adjacent to any installation equipment (34 in this example) at the liner entry point, and press-fitting into the channel 54 with a wheel (per Fig. 11).

Generally, the outward radial load due to pressure from within the liner is transmitted to the host pipe which resists the resultant hoop (radial) stress of the system. The force is transmitted both through the liner to the host, and, through the liner, then the member, to the host. The member therefore provides active resistance to collapse of the channel. However, for the channel to function as a fluid pathway, the member should not occupy the entire channel. With suitable member construction and geometry employed, sufficient cross sectional area can be maintained for venting and/or other fluid communication.

In one embodiment (see Fig. 12a), sufficient clear space is available between the member, and the liner at the outer surface of the liner even after pressurization (see Fig. 12d). (Although Figs. 12a and 12d show a cable-type member, the same advantages apply to a bar-type member.) In another, space is made available within the member (see Fig. 12b and 12e), in which the member is a helical spring. The teachings of Figs. 12b and 12e apply as well to members having hollow sections, interstitial openings, for example between cable fiber strands, etc. A member may also be an open section, e.g., a semicircular arch (see Fig. 12c and 12f). Members comprising hollow or open sections may be either solid or perforated.

Generally speaking, continuity may be provided by making the member of an effectively porous material, or by providing the member with lateral and longitudinal openings or perforations (such as a hollow member, a spring, or a cable with interstitial areas between the cable fiber strands) so as to permit fluid flow both into and along the member. In order to facilitate fluid flow, the member should not effect a seal which would prevent fluid permeating through the liner from reaching the annular pathway, or channel. Such a seal may occur, for example, when a solid semicircular member seated in a liner channel (see Fig. 12c) is displaced radially outward into intimate contact with the host pipe as the liner bore pressure is increased (see Fig. 12f). The edges of the member may intimately contact the host pipe, thus preventing permeating fluids from reaching the channel. In view of such considerations, therefore, a desirable alternative is to use a functionally porous member. In the above examples, the porous member may be a multi-strand cable or helical spring. Equally effectively, the desired porosity can be obtained by using a member made of an inherently porous material.

There are potential difficulties with braided members owing to installation technique, particularly when a diametric reduction method is used. Upon unloading tensile insertion stress from a liner/member system, the liner will simultaneously expand radially and contract longitudinally,

attempting to revert to its original geometry, or lowest potential energy. In some cases, the degree of liner contraction may be significantly greater than that of the member, particularly if the aforementioned affixation methods are not suitably employed. Localized differential slipping between the liner and the member may occur. In the case of a braided member, a 'birdcage' will form (see Fig. 13). If such occurrence is undesirable, it is best not to affix the member to the liner during installation. Rather, the member should be inserted into the liner channel relatively loosely, for minimal shear between the liner channel and the member, thus minimizing the potential for this problem to occur.

The use of a helical spring as the member within the channels is a highly preferred embodiment. It overcomes the potential difficulty with braided members discussed above. The spring member may be installed, tightly, at virtually any time in a multi-step or otherwise extensive diametric reduction process, and it can expand and contract with the liner through its loading, unloading and temperature cycles. The spring member concept may be less effective than a cable member, for example, in the extended insertion method described earlier, in which the cable protects the polyethylene liner from the stress of insertion, unless the spring constant of the helical spring is greater than the modulus of elasticity of the liner. However, the helical spring is highly effective for holding the channel open to maintain channel clearance. See Figs 12b and 12e. The member, as seen in transverse cross section, mimics a hollow tube, providing ample means for fluid movement and/or communication. In a longitudinal cross section, space between individual coils provides adequate area to receive annular fluids laterally into the member. Initially the spring member provides active resistance in support of the liner channel (Fig. 12b). When the operating pressure increases sufficiently, the spring member will reorient itself, assuming a lower vertical dimension (Fig. 12e), i.e., radially with respect to the liner/host system. The assumption of such a profile provides another threshold of effective resistance to liner channel collapse. Although the cross-sectional area will be somewhat diminished in this geometry, it will remain effective for its intended purpose.

In addition to the benefits above, i.e., allowing longer insertion lengths and holding the channel open, cable-type members have further advantages.

Specifically, a member located in the channel can be manufactured of an electrically and/or optically conductive material, e.g., conductive or fiberoptic cable. Thus, it can be used to carry electricity and/or data communications from end-to-end.

As described earlier, channel geometry may be designed to allow the cable to remain recessed within the liner channel during installation (see Figs. 8a-8b). This affords the cable member protection, overcoming concerns regarding integrity.

Electrically conductive members may be used to supply electric power and data to remote locations. This is a benefit in many applications. It is well illustrated by an offshore production pipeline. An important utility of the electrically conductive member is gained when the member is

a heat trace cable, known to the art. Heat from electrical resistance can be provided at any or all points along the line. Specific segments may be heated by defining sections in the cable member system and providing necessary switching for the current to address individual portions. Accordingly, the fluid in transit can be maintained within a desired temperature-viscosity range for flow optimization.

Fig. 14 shows a host pipe 60 with a liner 71 containing electrically conductive cable members 61-68. Note that members 64 and 65, for example, are disposed in a single channel in this embodiment. They are electrically discontinuous as shown, but can be mechanically connected by a suitable insulator or insulating material so that the combined members 64 and 65 can perform the mechanical pulling functions described hereinabove. Members 63, 64 are connected to a power source 69 for supplying power to a heating element 70 within the liner 71. A second power source 72 is connected by members 67, 68 to a second heating element 73. Members 61, 62, 65 and 66 are not used for electrical connections in this embodiment.

In this embodiment, the heating elements 70, 73 comprise conductive polymers with thermo-variable electrical resistance, preferably having a positive temperature coefficient of resistance, as known to the art, which are incorporated as part of the liner. See Figs. 15a-15b, which show two examples of host pipe 80, a polymer liner 81, a conductive polymer layer 82 and a conductive cable member 83. The cable member 83 is connected directly to the liner at discrete locations, and transfers electrical power to the conductive polymer layer 82, which thereupon heats up, and in turn transfers heat to the fluid.

Fig. 19 shows another embodiment which has elongated heating elements 110, 112, 114, such as resistance wires, rather than conductive polymer sheet material. In other respects, the embodiment of Fig. 19 is the same as that in Figs. 14-15b. The heating elements are disposed longitudinally, possibly in channels formed in the liner. The respective conductors and heating elements can be disposed either in the same channels or in different, possibly adjacent channels.

In another application, a conductive member 74 supplies electricity to a power flow control valve 75 or another downhole device located at a remote underwater wellsite, which makes a separate service line or umbilical unnecessary. As the cable member, fully protected by the host pipe, can perform the same service, it makes the extra line redundant and thus reduces overall project cost.

Similarly, with the electrically and/or optically conductive member 74, data transmission capabilities may be readily effected, with similar benefits.

Another important application for the invention as related to data transmission is in petroleum exploration, specifically enhancing 'measurement while drilling' systems. See Fig. 22 in PCT/US99/-----, referenced above. Currently, large quantities of acquired data are generally stored in downhole tools and analyzed upon withdrawal of the string of tubulars. This is because 'real-time' data transmission rates are extremely slow, e.g., 50 baud, due to acoustic signal attenuation when

the drilling fluid is used as the communications medium. A conductive cable member, deployed in a liner channel, and fully protected by the liner and the host tubular, permits a highly desirable increase the data stream rate, e.g., to 56K baud or more. The member(s) and liner may be inserted in a single long section of tubing, e.g., 25,000 feet long for example, for drilling with continuous coiled tubing. Alternatively, they may be inserted in conventional tubing lengths, with couplings known in the art being provided to maintain signal continuity in the joint areas. The same methodology can be applied to essentially horizontal tubulars, e.g., pipelines connected in series.

In addition to promoting improved fluid flow properties, by assisting in heating the liner as described above, conductive members may also be employed to reduce/remove blockages in the pipeline such as hydrates and/or wax accumulations. In such an instance, the location of the blockage is determined (as shown for example in the cross-referenced patent disclosures) and then electrical power is applied to heat the problematic area, as described above. This reduces the blockage by melting or subliming it, permitting flow to resume normally.

The current invention also allows cable type members disposed within the channels to be used to locate blockages in the line, primarily by means of two important features. First, as described above, the channel provides a protective close-tolerance envelope during installation for the members required locate blockages. Second, signal characteristics, electrical or optical, through said members change in conjunction with changes in the operating conditions in the pipeline. Accordingly, signal data, which is indicative of specific sets of operating conditions, is obtained and analyzed to predict the location of the problem.

By illustration, when the line shifts from normal operations mode, i.e., a fully flowing line, to that when a blockage forms, the physical stresses felt by the member are also changed. The portion of the member upstream of the blockage will be under greater compressive stress than the area downstream, due to higher line pressure transmitted through both liner and member, as discussed above.

Electric strain gauge characteristics, known to the art, may be employed in the electrically conductive member. Electrical resistance of the member will vary in accordance with stress. See Fig. 16. In this embodiment, a cable member 90, disposed in a channel helically oriented along the length of the liner, is both stretched and compressed upstream of the blockage, in area "B." Downstream, in area "A," pressure and tension are not so pronounced. Fig. 16a-16d are isometric schematic and cutaway views illustrating differential stress configurations on the member. Both types of distortion affect the transmission properties of the cable member, i.e., differential resistance. The data can be compared to baseline resistance for analysis and blockage location determination. In order to further refine the accuracy of location, pressures upstream and downstream of the blockage may also be manipulated.

The following is a description of the blockage detection feature of the invention, as illustrated in the schematic of Figs. 16a-16d.

The effects as described below are most evident where the members are conductive cables that are spirally wound around the liner along the liner's entire length and laid within a channel. Accordingly, this serves as the preferred embodiment, and is used for illustration purposes. Notwithstanding, the utility may be gained through other variations and embodiments, e.g., with the cable laid longitudinally, etc., possibly requiring greater discernment capabilities in the measurement equipment.

Within the normal range of operating conditions for the system, the cable as laid in the channel achieves an equilibrium length. The liner is pressed outward to the host pipe, and as it does so, the cable is stretched to a static length by virtue of its intimate proximity to the liner. The relative position of the components of the system is illustrated in transverse cross section in Fig. 16b.

When an electric current is passed in a circuit made by the cable so disposed in equilibrium, an essentially constant resistance may be recorded. An instrument, e.g. ohmmeter, to effect this may be located at one or both ends of the circuit, the latter illustrated in the figure.

Algebraically: $R=Lr$

where, R is total resistance

L is total cable length

r is unit resistance

Pipeline length may also be correlated directly to the known cable length and resistance according to cable layout geometry within the system. In the case where spiral winding is constant per unit length of pipe:

$$D = f(L), \text{ or,}$$

$$D = f(R/r)$$

where, D is the length of pipeline

f is a mathematical function which is related to the materials and geometry employed

Other cable layout geometries may require other unique functions to relate cable length and distance, but the principle remains the same.

With an increase in pressure, the cable will be physically affected which will in turn result in a change of electrical resistance. This is due to the fact that the height of the liner channels will be reduced in reaction to the increased pressure, and thus the cable will be likewise displaced, illustrated in transverse cross section in Fig. 16d. In the case of the spirally wound cable, the net effect is that the cable will lengthen and correspondingly reduce in cross sectional area. Other cable laydown configurations will exhibit corresponding deformations, unique to the geometry. In any event, however, a change in total resistance will be evident.

Algebraically: $R'=L'r'$

where, R' is the new total resistance

L' is the modified cable length, varying according to layout and pressure

r' is the modified unit resistance, if appropriate, relative to cable type and layout

In the practical and relevant aspect, when a blockage occurs within the bore of the line, pressure will increase only upstream of the location. Thus the physical effects to the cable will be evident on this side as well.

Algebraically: $R'' = L'' r''$

where, R'' is the total resistance of the cable in the blocked pipe system

L'' is the modified cable length, varying according to layout and pressure

r'' is the modified unit resistance, if appropriate, relative to cable type and layout

If electrical resistance properties for the cable are known, the location of the blockage can be determined by algebraic manipulation. As an example, using the simple case where the unit resistance change is negligible, i.e., $r \approx r' \approx r''$:

$$d = D \times [(R'' - R)/(R' - R)]$$

where d = the distance to the blockage, as measured from the end of the pipe having greater pressure.

This example, though simplistic, is provided to demonstrate the principles of the invention. As indicated above, however, other factors, e.g., materials employed, conductor configuration, operational temperature and pressure range, etc., may suggest an appropriate modification to the algebraic formulation in order to effect a solution for a particular set of variables.

Figure 17 illustrates a fibre-optic system analogous to the electrical conductive member case described above. In this case the annular member 95 comprises one or more glass fibers, or other internally reflective material whose nominal properties relating to indices of internal reflectivity are available.

Analogous to the electrically conductive case where the resistance changes; when the fibre member is deformed, properties relating to its internal reflective index are subject to change. This physical change results in a measurable change of characteristics when a light signal is introduced to the fibre and thereafter detected. Such changes, e.g., light intensity, reflection circuit time, wavelength changes, etc., can be measured with suitable instrumentation.

As in the above case, deformation of the fibre can result from a compartmentalized pressure excursion owing to the formation of a blockage within the pipe bore and subsequent influence on liner geometry.

As the fibre light conducting properties are known, and can be measured in a nominal, pre-blockage state, and also after a blockage, the differences in the resulting signals can be mathematically analyzed, in a fashion related to the electrically conductive member case, to resolve the position of the blockage along the pipeline.

Unlike the electrically conductive case, however, the preferred embodiment is that the fibre optic members be laid in a relatively straight fashion in the annulus, parallel to the longitudinal axis.

This is to minimize compounding of torsional stresses upon insertion, and to minimize cost. Notwithstanding, other layouts, such as the helically wound one mentioned above will be functional.

Although embodiments of the invention have been described herein, the invention is not limited to such embodiments, but rather includes all modifications and variations that may occur to one having the ordinary level of skill in the art.

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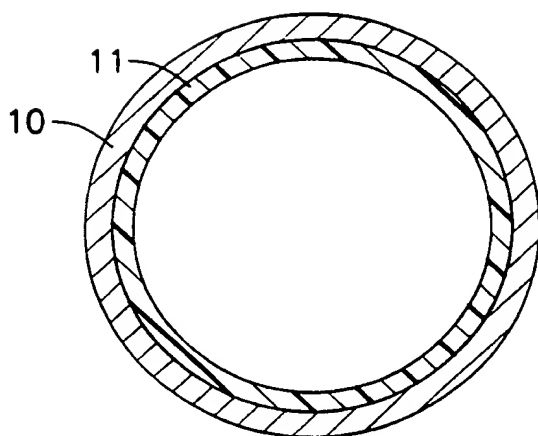


Fig. 1
Prior Art

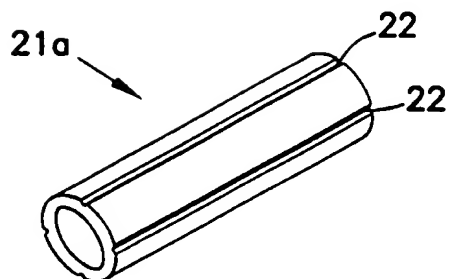


Fig. 3a

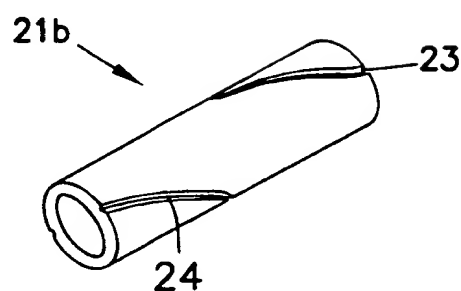


Fig. 3b

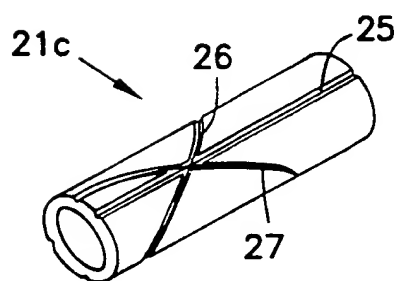


Fig. 3c

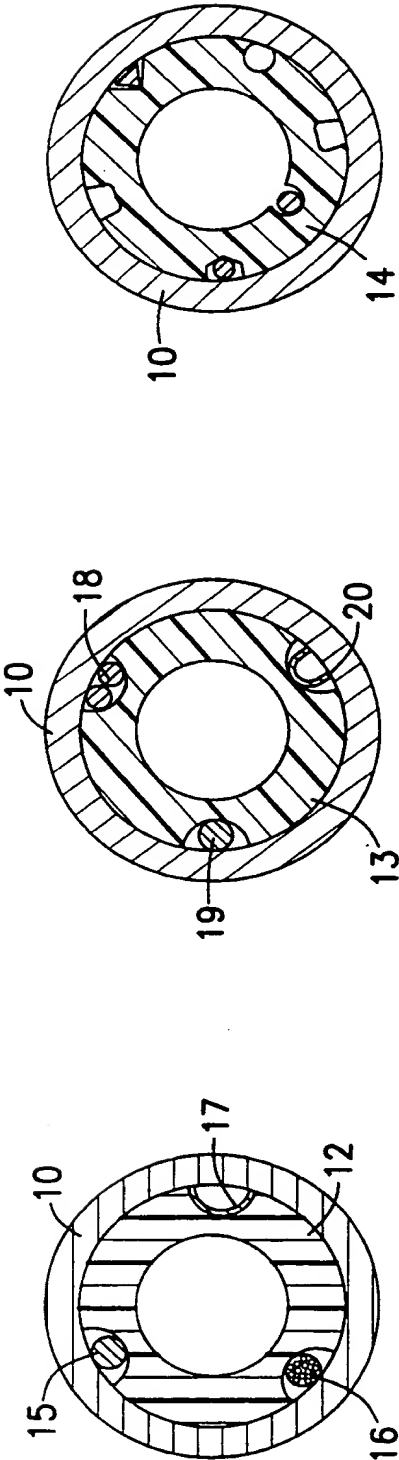


Fig. 2a Fig. 2b Fig. 2c

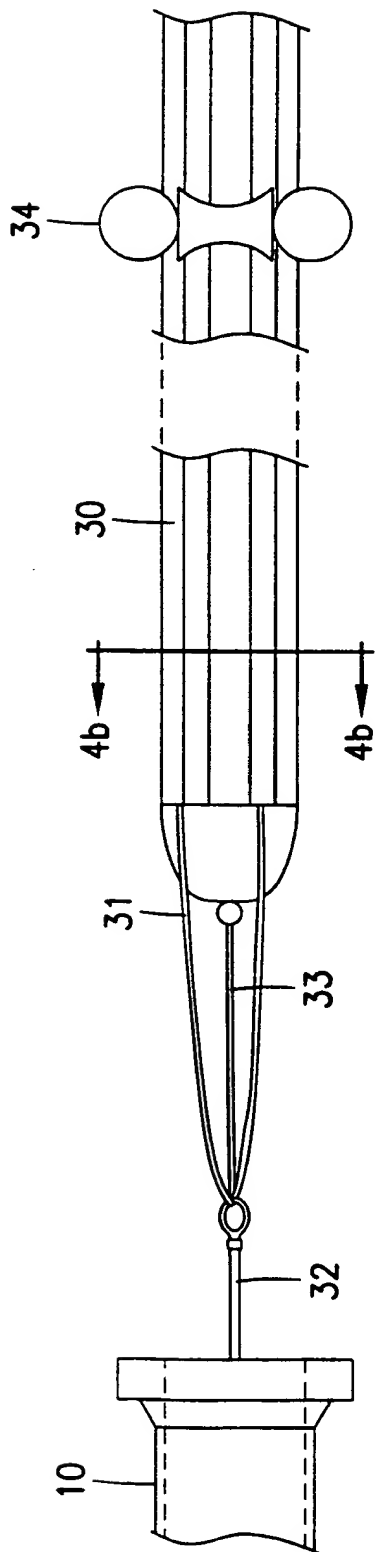


Fig. 4a

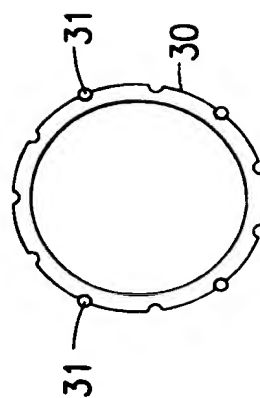


Fig. 4b

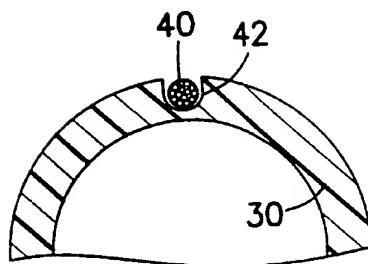


Fig. 5a

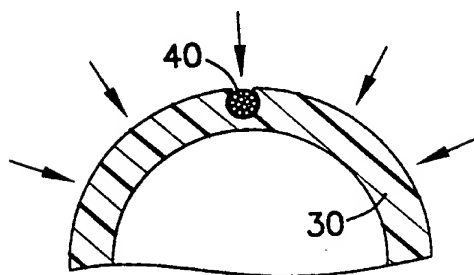


Fig. 5b

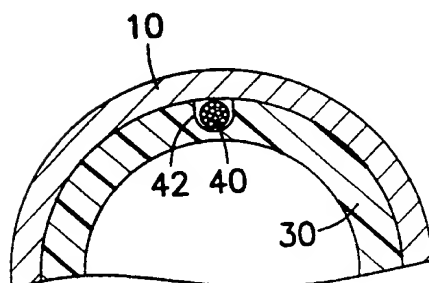


Fig. 5c

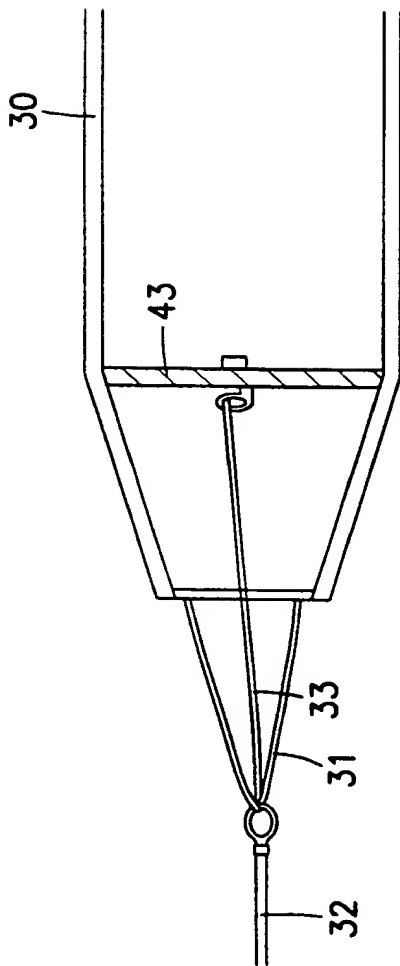


Fig. 6

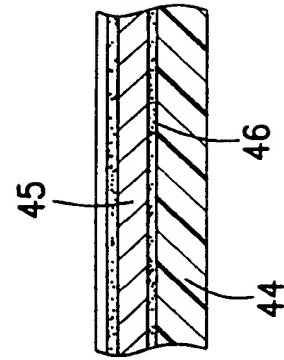


Fig. 7c

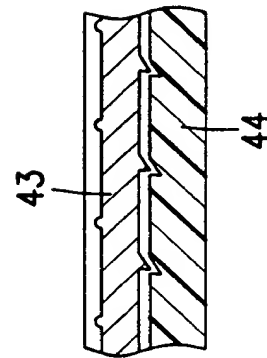


Fig. 7b

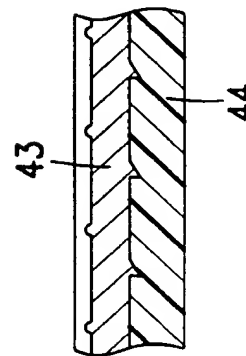


Fig. 7a

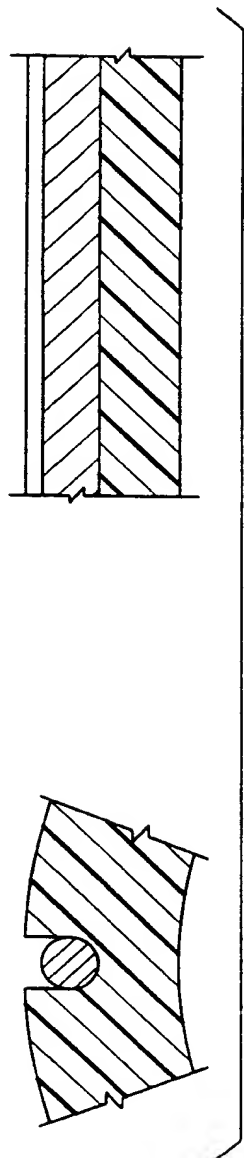


Fig. 8a

PROTRUSION

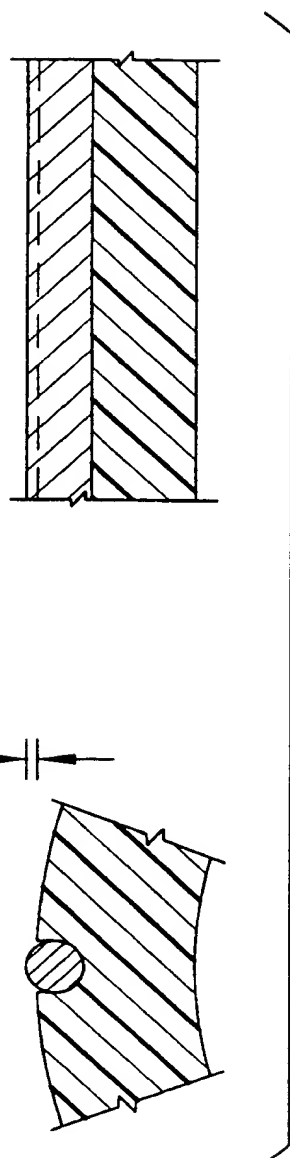
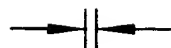


Fig. 8b

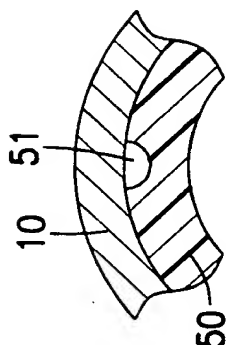


Fig. 9a

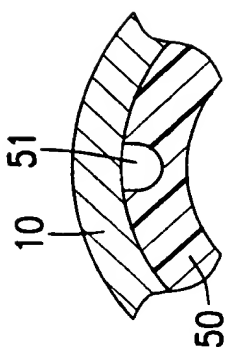


Fig. 9b

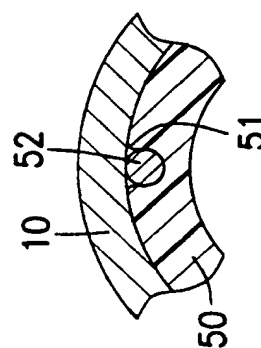


Fig. 10

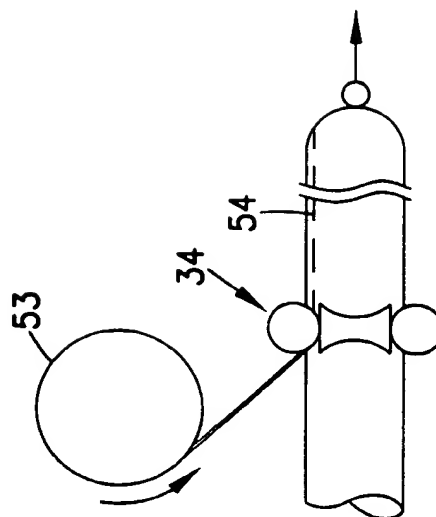


Fig. 11

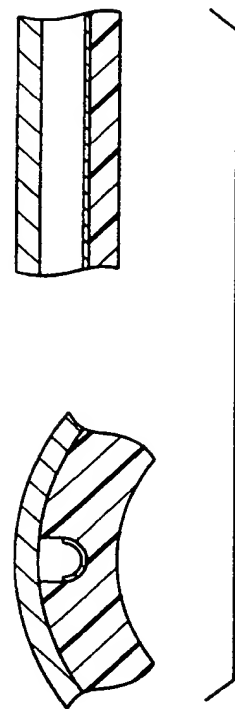


Fig. 12c

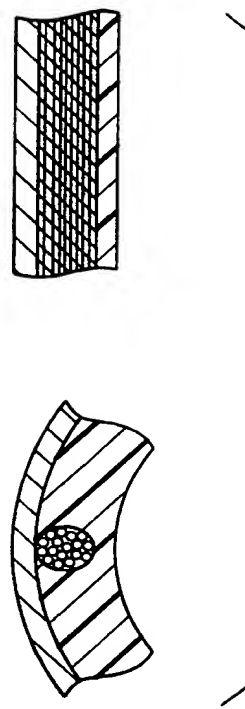


Fig. 12d

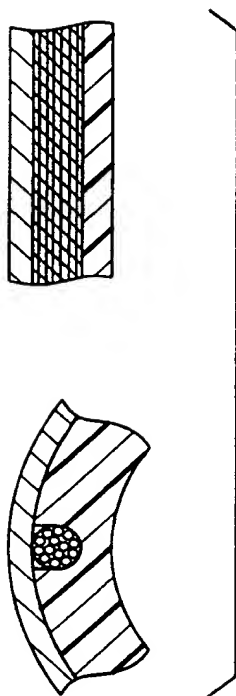


Fig. 12a

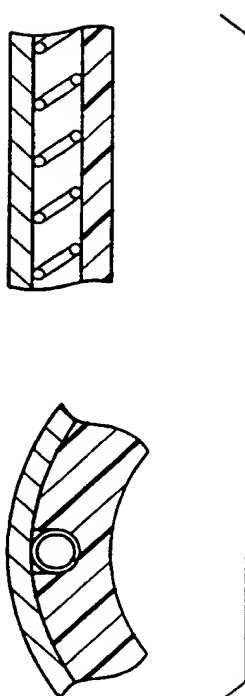


Fig. 12b

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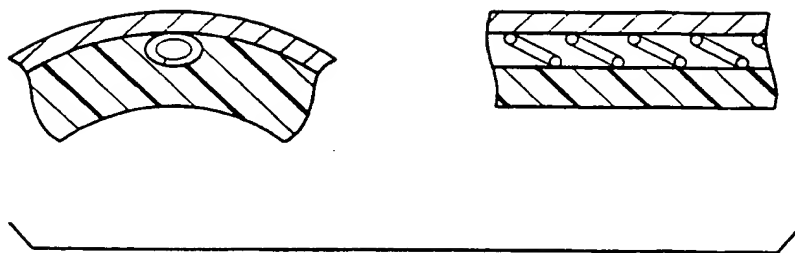


Fig. 12e

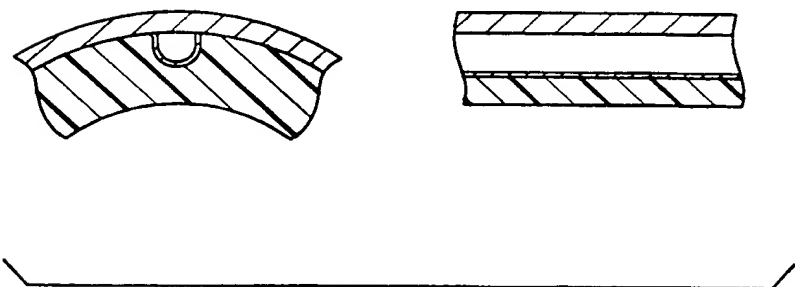


Fig. 12f

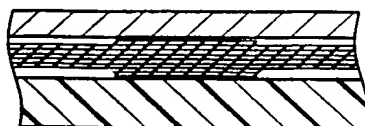


Fig. 13

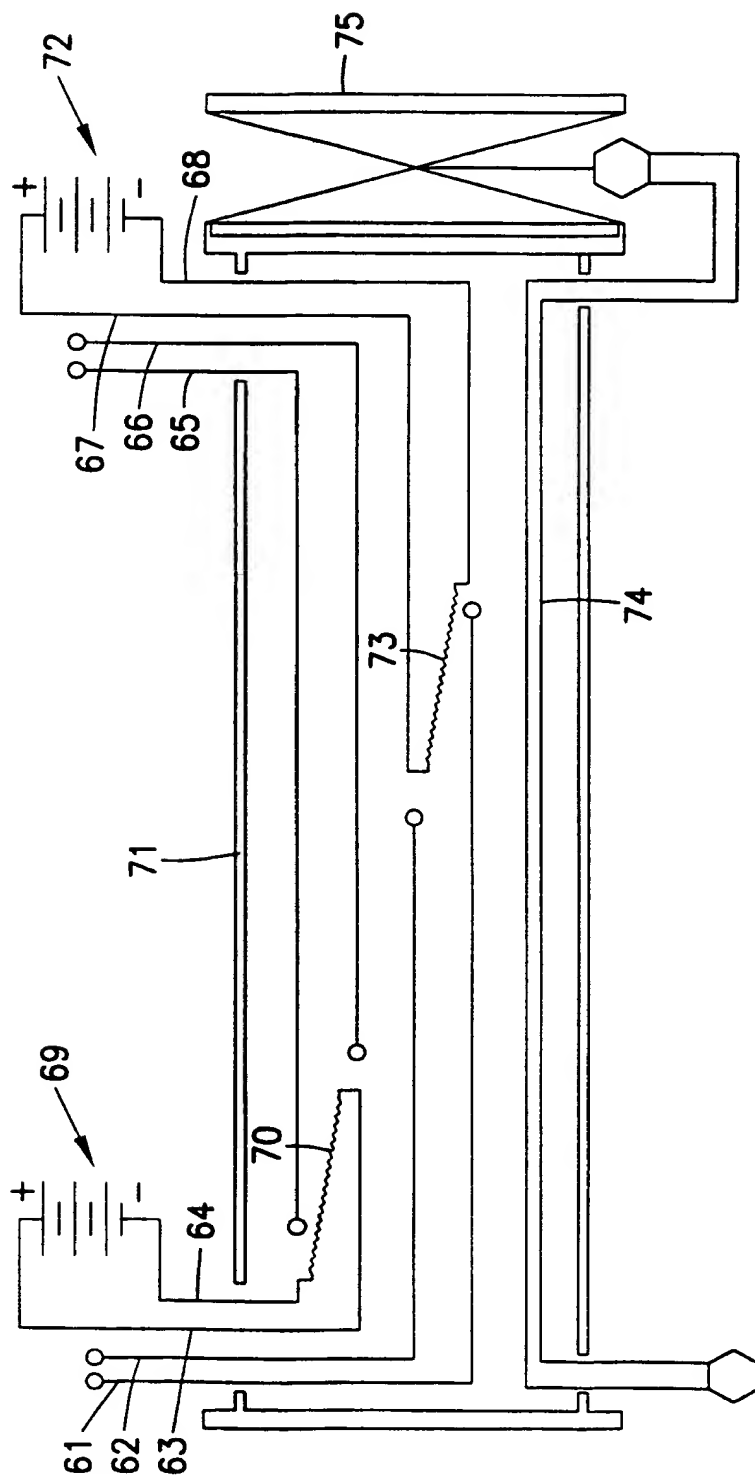


Fig. 14

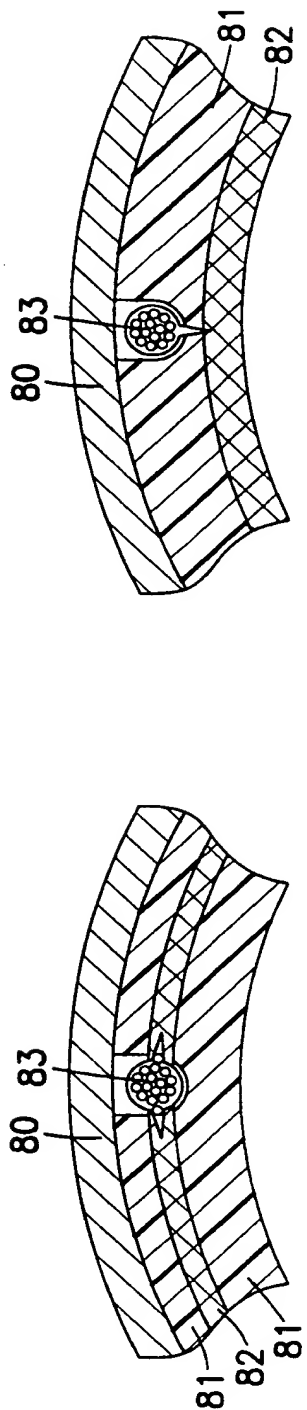


Fig. 15a Fig. 15b

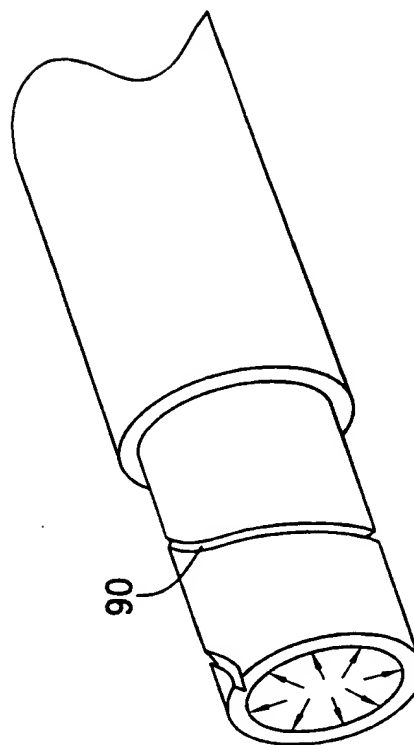


Fig. 16a

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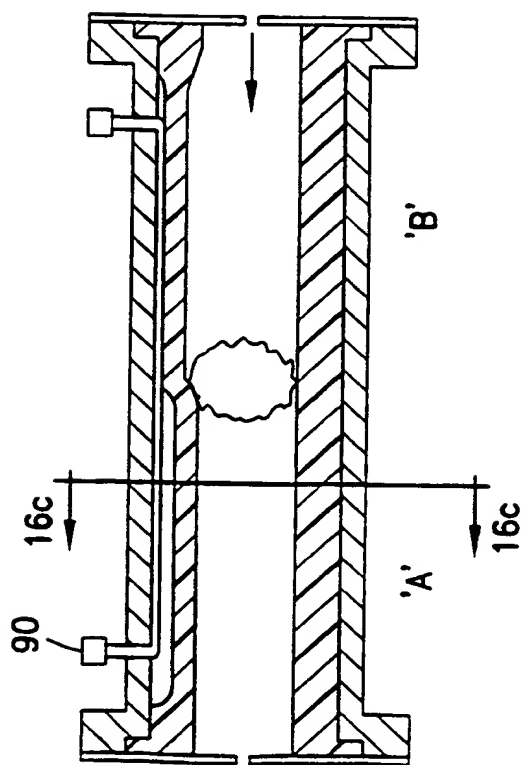


Fig. 16b

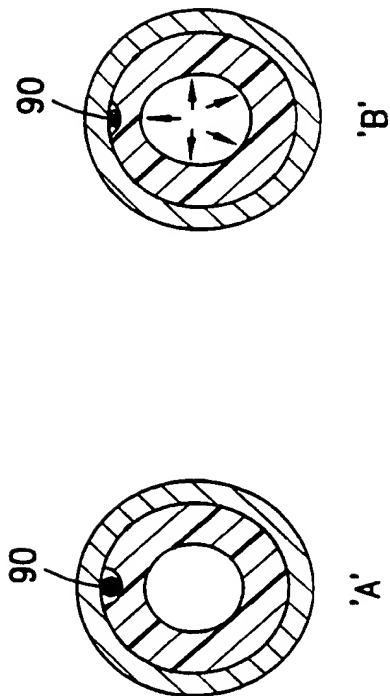


Fig. 16c

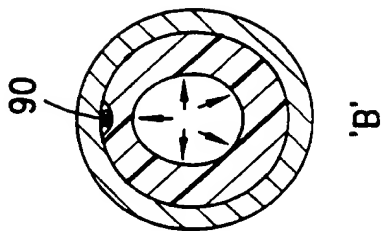


Fig. 16d

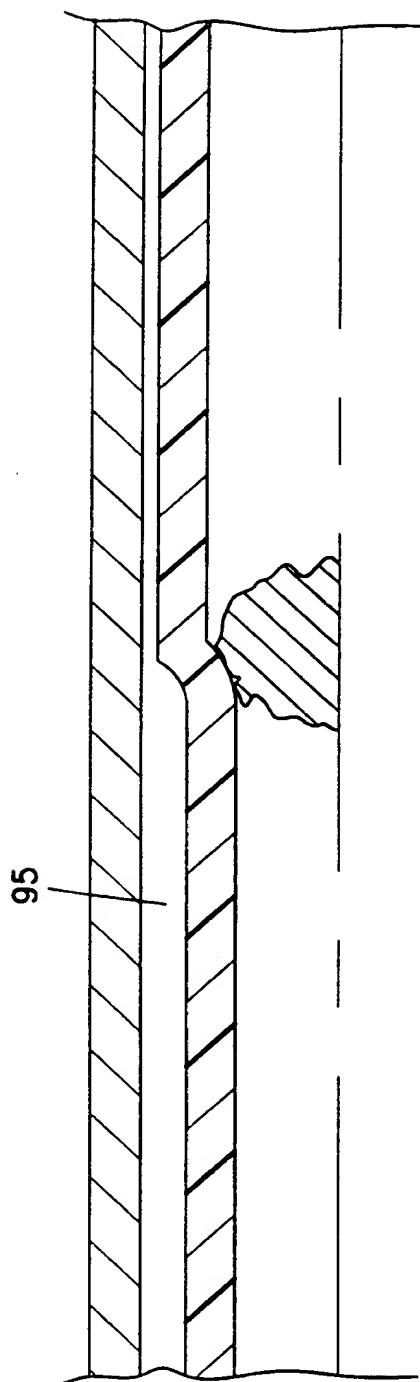


Fig. 17

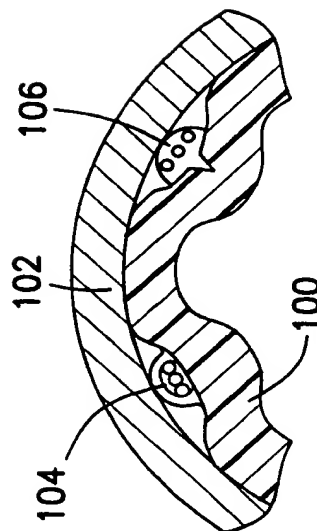


Fig. 18b

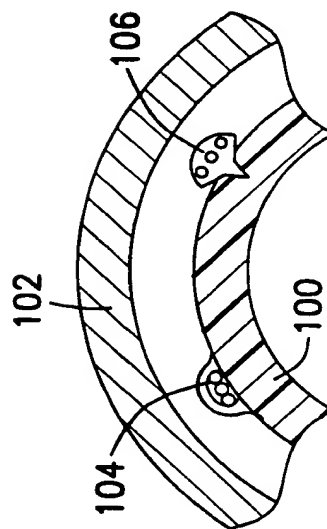


Fig. 18a

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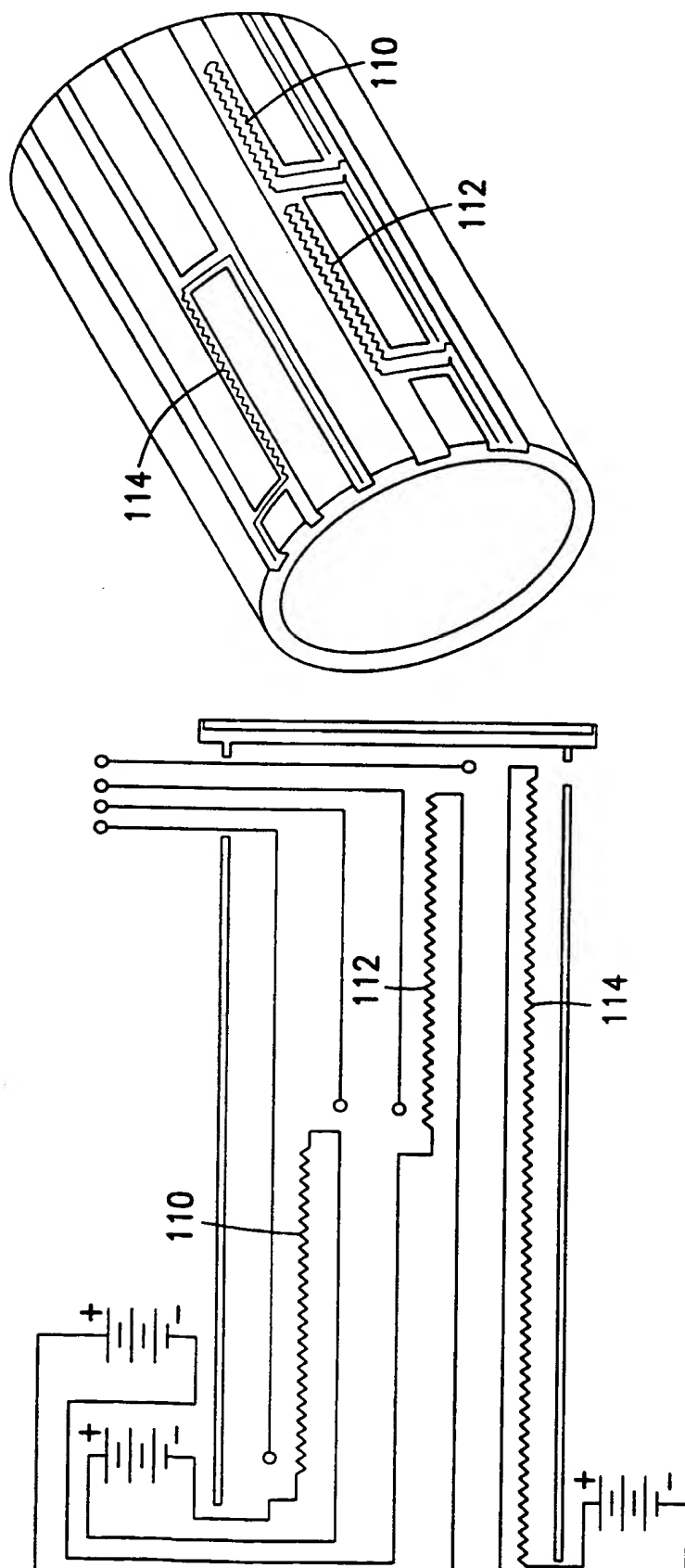


Fig. 19

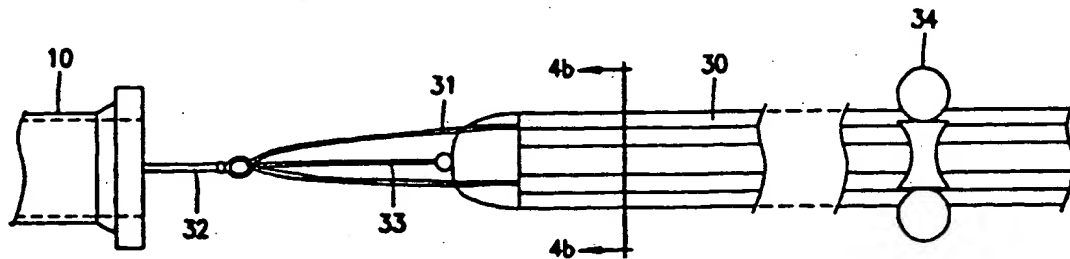


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<p>(21) International Application Number: PCT/US99/16968</p> <p>(22) International Filing Date: 28 July 1999 (28.07.99)</p> <p>(30) Priority Data: 60/094,326 28 July 1998 (28.07.98) US</p> <p>(71) Applicant (for all designated States except US): SAFETY-LINER SYSTEMS, LLC [US/US]; 27286 Jimmy Lane, Conroe, TX 77385 (US).</p> <p>(72) Inventors; and 75) Inventors/Applicants (for US only): TAYLOR, Jack, Curtis [US/US]; 27221 Kane Lane, Conroe, TX 77385 (US). ROACH, Max, Jerry [US/US]; 27286 Jimmy Lane, Conroe, TX 77385 (US).</p> <p>(74) Agents: FINDER, James, A. et al.; Ostrolenk, Faber, Gerb & Soffen, LLP, 1180 Avenue of the Americas, New York, NY 10036 (US).</p>	<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p>Published <i>With international search report.</i></p> <p>(88) Date of publication of the international search report: 22 June 2000 (22.06.00)</p>	

(54) Title: **ENHANCEMENT OF PROFILED TUBULAR LINING SYSTEMS BY CHANNEL AUGMENTATION**

(57) Abstract

A tubular system made up of a tubular (10), a liner (12) in the tubular (10), and longitudinally oriented members (15, 16, and 17), which may be disposed within the channels in the liner. The members advantageously may be used for pulling a liner into a host tubular, and/or maintaining the structural strength of the liner (12). The members are continuous along the length of the plastic-lined tubular (10) and if applicable, through intermediary joints. The channels may be in the inner and/or outer surfaces of the liner (12). The members may be usable for carrying electrical current or signals, fiberoptic signals, or data communications; for heating the liner; and/or for detecting faults in the liner and/or the host tubular (10).

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WHAT IS CLAIMED IS:

1. A method of assembling a tubular system,
the tubular system comprising a tubular; a liner in the tubular, the liner having an outer wall engaging an inner wall of the tubular, the liner having an inner wall defining a hollow bore; and at least one elongated member which is disposed between said liner and said tubular and defines a fluid flow passage between said liner and said tubular;
said method comprising the steps of:
placing said liner and said member in contact with each other;
while said liner and said member are in contact, pulling on said elongated member in order to pull said liner and said elongated member together into said tubular.
2. The method of claim 1, wherein after said pulling step, said member is disposed between said outer liner surface and said tubular and thereby deforms said liner so as to define said fluid flow passage.
3. The method of claim 1, wherein said member is disposed in a channel which is formed in a surface of said liner.
4. The method of claim 1, further comprising the steps of:
placing a predetermined initial stress on said liner so as to induce a strain; and then
adhering said liner and said member to each other;
wherein in said pulling step, said liner is pulled along with said member into said tubular without inducing substantial additional strain on said liner.
5. The method of claim 4, wherein said adhering step comprises the step of providing barbs on said member.
6. The method of claim 4, wherein said adhering step comprises the step of applying heat to said member.
7. The method of claim 6, wherein said adhering step further comprises the step of applying an adhesive between said member and said liner.

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8. The method of claim 6, wherein said heat is applied by passing an electric current through said member.

9. The method of claim 6, wherein said heat is applied by radiation from the exterior of said liner.

10. The method of claim 4, wherein said adhering step comprises the step of applying an adhesive between said member and said liner.

11. The method of claim 4,
wherein said member is disposed in a channel which is formed in said outer surface of said liner, and
wherein said adhering step comprises the steps of disposing said member in said channel, then radially compressing the liner so that said channel grips said member.

12. The method of claim 11, wherein said member comprises a cable.

13. The method of claim 11, wherein said member comprises a generally helical spring.

14. The method of claim 13, wherein said spring has a spring constant which is stiffer than a modulus of elasticity of said liner so that said liner is pulled by said member into said tubular without placing substantial additional strain on said liner.

15. The method of claim 11, wherein said member when in said channel is disposed fully inside said outer surface of said liner.

16. The method of claim 15, wherein said member is adhered to said liner sufficiently to remain in said channel.

17. The method of claim 11, wherein said member is adhered to said liner sufficiently to remain in said channel.

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18. The method of claim 11, further comprising the step of making said member of a sufficiently strong material to resist deformation of said channel due to increased pressure in said liner bore.

19. The method of claim 11, further comprising the step of making said member of a sufficiently strong material to resist deformation of said channel due to thermal softening of said liner.

20. The method of claim 11, further comprising the step of making said member of a sufficiently strong material to resist deformation of said channel due to swelling of said liner upon contact with materials in said liner bore.

21. A tubular system with internal heating, comprising:
a host tubular;
a liner in the tubular, the liner having an outer wall engaging an inner wall of the tubular, the liner having an inner wall defining a hollow bore; and
at least one electrically conductive elongated member disposed between said host tubular and said liner;
said liner comprising an electrical heating element connected to said at least one member for receiving electrical current from said member and thereby heating said tubular system;
wherein said tubular system is assembled by the steps of:
securing said liner and at least one elongated member to each other; and
then pulling on said member, so that said liner is pulled, along with said member, into said tubular.

22. The tubular system of claim 21, the liner having at least one channel formed therein, said member being disposed in said at least one channel.

23. The tubular system of claim 22, wherein said electrical heating element is a conductive polymer layer which has an electrical resistance and forms a part of said liner.

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24. The tubular system of claim 22, wherein said electrical heating element is an electrically resistive wire disposed in said at least one channel.

25. The tubular system of claim 21, wherein said tubular system is further assembled by the steps of:

placing a predetermined initial stress on said liner so as to induce a strain; and

then pulling on said member, so that said liner is pulled, along with said member, into said tubular without inducing substantial additional strain on said liner.

26. A tubular system with internal heating, comprising:

a host tubular;

a liner in the tubular, the liner having an outer wall engaging an inner wall of the tubular, the liner having an inner wall defining a hollow bore; and

at least one electrically conductive elongated member disposed between said host tubular and said liner;

said liner comprising an electrical heating element connected to said at least one member for receiving electrical current from said member and thereby heating said tubular system;

wherein said member is adhered to said liner and has sufficient tensile strength to be usable to pull said liner into said tubular without inducing substantial strain in said liner.

27. A tubular system adapted for determining the location of a blockage therein, the tubular system comprising:

a tubular;

a liner in the tubular, the liner having at least one channel formed therein; an outer wall of the liner engaging an inner wall of the tubular; the liner having an inner wall defining a hollow bore; and

at least one elongated sensing member which is disposed in said at least one channel and is responsive to pressure in said hollow bore within said liner, and produces a pressure

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signal which is indicative of said location of said blockage.

28. The tubular system of claim 27, wherein said elongated sensing member comprises an electrical strain gauge.

29. The tubular system of claim 27, wherein said elongated sensing member comprises at least one optical fiber.

30. The tubular system of claim 27, wherein said member is adhered to said liner and has sufficient tensile strength to be usable to pull said liner into said tubular without inducing substantial strain in said liner.

31. A method of determining the location of a blockage in a tubular system, the tubular system comprising:

a tubular; and

a liner in the tubular, the liner having at least one channel formed therein; an outer wall of the liner engaging an inner wall of the tubular; the liner having an inner wall defining a hollow bore; said method comprising the steps of:

placing at least one elongated sensing member in said at least one channel, said sensing member being responsive to pressure in said hollow bore within said liner, said pressure being indicative of said location of said blockage;

applying an input signal to said sensing member; and

receiving an output signal from said sensing member and processing said output signal to determine said location of said location of said blockage.

32. The method of claim 31, wherein said sensing member comprises an electrical strain gauge and said input and output signals are electrical.

33. The method of claim 31, wherein said sensing member comprises at least one optical fiber and said input and output signals are optical.

34. The method of claim 31, wherein said tubular system is assembled by the steps

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of:

placing a predetermined initial stress on said liner so as to induce a strain;
then adhering said liner to at least one elongated member; and
then pulling on said member, so that said liner is pulled, along with said member, into said tubular without inducing substantial additional strain on said liner.

35. A method of assembling a tubular system,
the tubular system comprising a tubular; a liner in the tubular, the liner having an outer wall engaging an inner wall of the tubular, the liner having an inner wall defining a hollow bore; and at least one elongated member which is disposed between said liner and said tubular and defines a fluid flow passage between said liner and said tubular;
said method comprising the steps of:
placing said liner and said member in contact with each other;
while said liner and said member remain in contact, pulling on said elongated member in order to pull said liner and said member together into said tubular.

36. The method of claim 35, wherein said contact between said elongated member and said liner protects said elongated member from deformation while being pulled into said tubular.

37. The method of claim 36, wherein said elongated member comprises a communications cable.

38. The method of claim 36, wherein said elongated member comprises a heating cable.

39. The method of claim 36, wherein said elongated member comprises a force-sensing cable.

40. The method of claim 36, wherein said elongated member comprises an electrical or fluid-carrying conduit.

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- ~~41. A method of assembling a tubular system,
the tubular system comprising a tubular; a liner in the tubular, the liner having an
outer wall engaging an inner wall of the tubular, the liner having an inner wall defining a
hollow bore; and at least one elongated member which is disposed between said liner and said
tubular and defines a fluid flow passage between said liner and said tubular;
said method comprising the steps of:
placing said liner and said member in contact with each other;
while said liner and said member remain in contact, pulling said liner into said
tubular;
wherein said contact between said elongated member and said liner protects said
elongated member from deformation while being pulled into said tubular;
wherein said member is disposed in a channel which is formed in said outer surface of
said liner, and
wherein said adhering step comprises the steps of disposing said member in said
channel, then compressing said channel so that said channel grips said elongated member.~~
42. The method of claim 41, wherein said member and liner are pulled into said
tubular with said channel still compressed.
43. The method of claim 41, wherein said channel is compressed by radially
compressing said liner.
44. The method of claim 43, wherein said member and said liner are pulled into said
tubular with said liner still compressed.
45. The method of claim 11, wherein said member and said liner are pulled into said
tubular with said liner still compressed.